THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXIII. No. 577.] LONDON, JUNE 2, 1874. [26th Year.] Price 6d.

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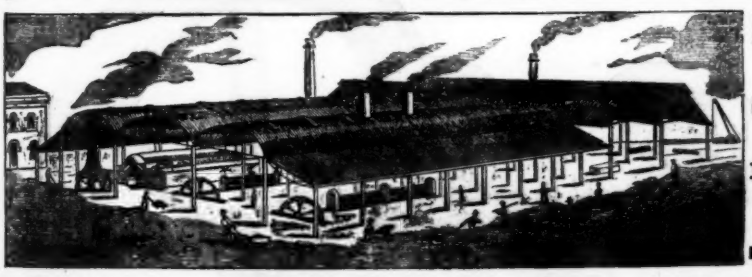

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For Roofs with Timber Framing, I. D.'S GALVANIZED OR PAINTED CORRUGATED SLATES OR SHEETS form a durable and cheap covering, costing only about the same, when fixed complete, as felt and boards.

DRAWINGS AND ESTIMATES ON APPLICATION.

LIME SUPERSEDED

IN THE

PURIFICATION OF ILLUMINATING GAS,

BY

Spence's Patent Dry Copperas,

The only Purifying Material which removes, by one process, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of four years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION.

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Manufacturers of SPENCE'S PATENT DRY COPPERAS: GREEN COPPERAS;

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CONTRACTORS FOR THE PURCHASE OF SPENT OXIDE.

ALL COMMUNICATIONS TO BE ADDRESSED TO THE WORKS.

GEORGE WALLER & CO.,

GAS ENGINEERS AND CONTRACTORS,

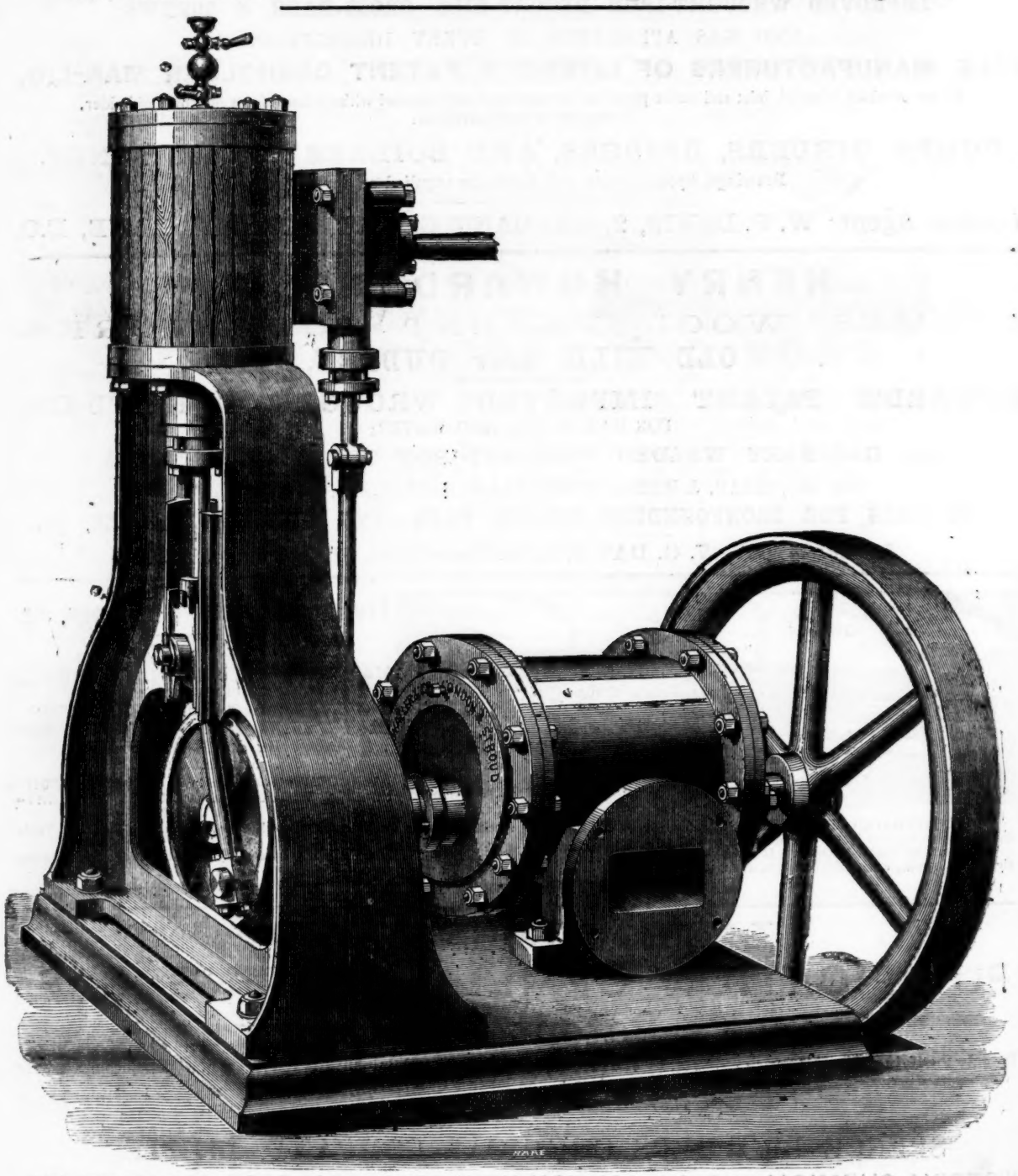
SOLE MAKERS OF

Beale's Improved

PATENT GAS-EXHAUSTERS AND COMBINED ENGINES,

ON ONE BASE PLATE.

NOTE.—The Exhausters are extra large for moderate speed.



This COMBINED VERTICAL ENGINE and EXHAUSTER was specially designed by G. WALLER AND CO. for small works, where space is an object, and is applicable for Exhausters from 1000 to 15,000 per hour. This is the *only* Engine and Exhauster **complete on one Base Plate,** requiring only one foundation.

NOTE.—They are sent away complete, and are easily fixed.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, SOUTHWARK, S.E.,

AND AT

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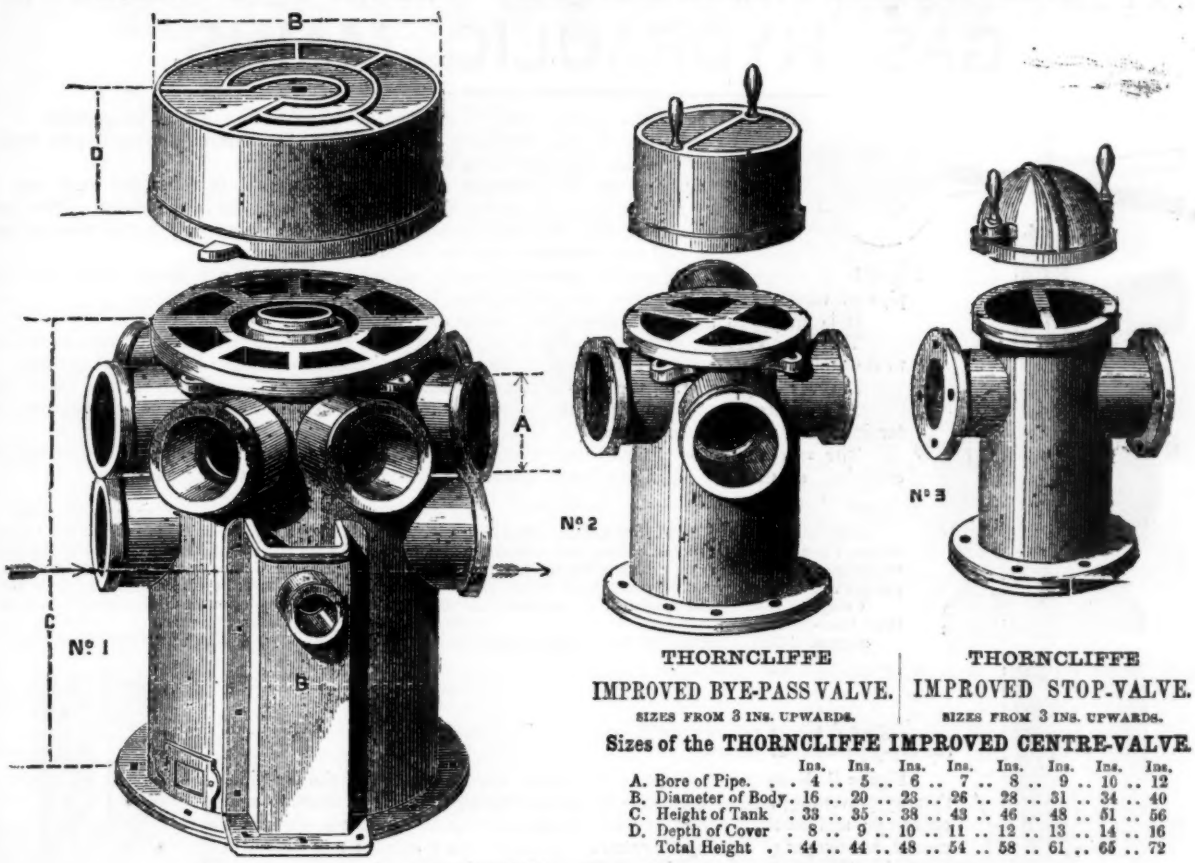
MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

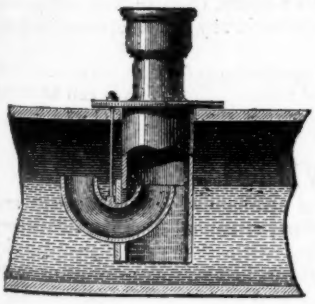
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Messrs. N. C. & Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING DIP-PIPES.

These Patent Self-Acting Dip-Pipes are rapidly coming into general use by gas companies. By their use the whole of the pressure caused by the old kind of Dip-Pipes is entirely removed, therefore the yield of gas per ton of coal is considerably increased. They also act as a perfect safeguard against the deposit of carbon (or scurf) inside the retorts.

A saving of fuel is effected, and the wear and tear to the retorts greatly diminished.

They are also perfectly Self-Acting, they being regulated solely by the gas. They cannot get out of repair, and when once fixed, will last as long as the old kind, and can be easily adjusted should the hydraulic main sink; they can also be worked with advantage where there is no exhauster.

Testimonials can be had from Herbert Unwin, Esq., engineer of the Sheffield United Gaslight Company and the Penistone Gas Company. At both these companies works they have been in constant operation for several months. Further testimonials can be had on application to the Patentee, J. G. Hawkins, Effingham Street Gas-Works, Sheffield.

For Prices, &c., apply to

Messrs. NEWTON, CHAMBERS, & CO.,

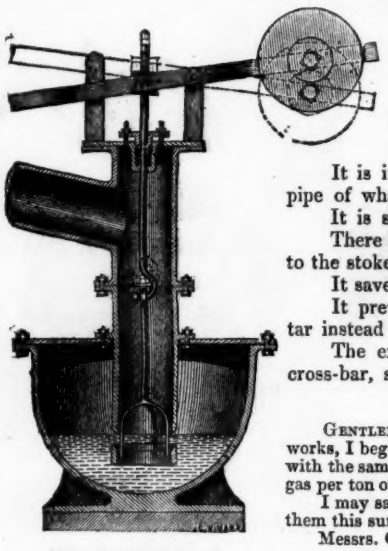
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.



It relieves the retorts from all pressure during the time gas is being made.

The end of the dip-pipe not being immersed in the tar, permits the gas to pass freely, and without pressure, from the retort into the hydraulic main.

The dip-pipe can be effectually sealed without trouble, to resist the back rush of gas, *to any possible pressure*, during the time of charging; but in the event of the Seal being left on, after the retort is closed, no inconvenience is caused, as the piece of pipe used as the Seal only lengthens it to an ordinary dip-pipe.

It is inexpensive, and can be easily and readily applied to any existing hydraulic main and dip-pipe of whatever shape or size, at a trifling cost.

It is simple in its arrangement, and cannot get out of order.

There is no deposit of carbon on the top of the retort, thereby saving considerable time and trouble to the stokers when drawing and charging, also the injury caused by scurfing the retort is avoided.

It saves 10 per cent. of the coal carbonized; also the same proportion of fuel, retorts, labour, &c.

It prevents the thickening of the tar in the hydraulic main, as the heated gas passes *over* the tar instead of being forced *through* it.

The extension piece of pipe is moved by a lever, from which hangs a $\frac{3}{8}$-inch rod, hooked on the cross-bar, so that the lid of the retort cannot be struck without first sealing the pipe.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the make in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street. WM. TRIMMING, Secretary.

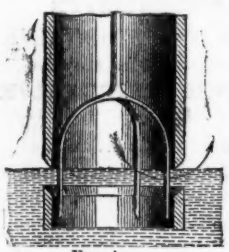


FIG. A.

Figure A shows the extension piece lowered to permit the gas to pass out of the dip-pipe without pressure.

Figure B shows the extension piece raised against the end of the dip-pipe, thereby preventing any back passage of the gas during the time of drawing and charging; and should it be left up while the gas is being made, no inconvenience is caused, *nor danger of bursting the retorts incurred; it being an open pipe and not a solid plug*, the gas will pass under as with the usual dip-pipe.

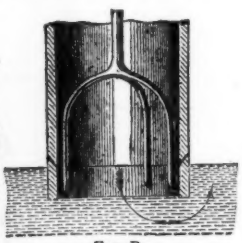


FIG. B.

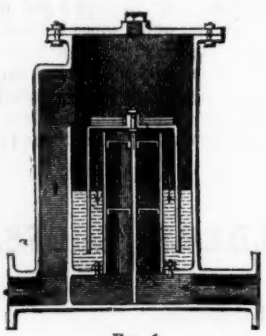


FIG. 1.

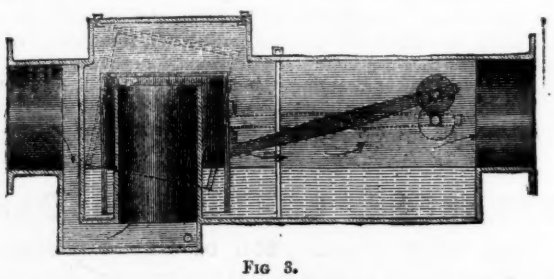


FIG 3.

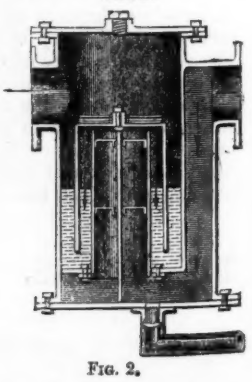


FIG. 2.

BYE-PASS FOR EXHAUSTER (Fig. 1).

This Hydraulic Bye-Pass has been invented for the purpose of supplying to gas companies a cheap, effective, and self-acting valve. It is simple in its construction, cannot get out of order, perfect in its action, can be made to stand any pressure, occupies very little space, and can be adapted to any existing pipes.

Fig. 2 is a Valve similar to Fig. 1, but made to act as a self-acting hydraulic bye-pass for washers, condensers, scrubbers, and meters; the Valve part being *below* the inlet and outlet, so that it may be applied to underground mains. Both Valves can be fitted to existing mains without disturbing them, more than the cutting out of a sufficient length to permit the fitting in of the Valve; after being properly fitted, they will require no further attention.

SELF-ACTING HYDRAULIC SAFETY-VALVE (Fig. 3),

For preventing the back flow of gas from the gasholder, and thereby preventing the possibility of accidents (the great damage and danger to life and property resulting therefrom) through the breaking of pipes, unsealing of purifiers, or any other cause. It is easy and prompt in its action, for upon the forward pressure of the gas ceasing, the bonnet *instantly* closes over the stand-pipe, thereby effectually preventing any return of the gas; no extra pressure is put upon any part of the works by its use, and it can be made to stand any required pressure.

Every information can be obtained, and Models seen, at the Offices of the Company,

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TANGYE BROTHERS AND HOLMAN,

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SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

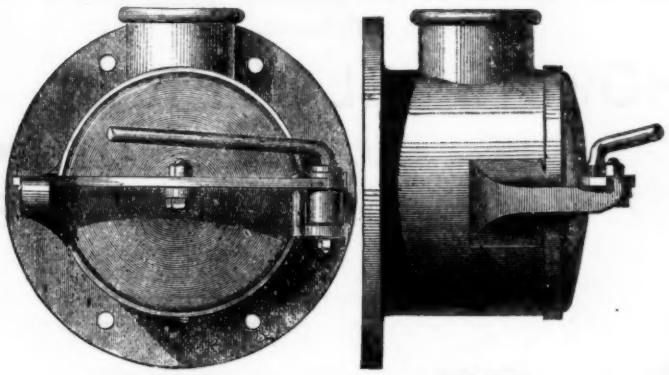
HOLMAN'S PATENT ECCENTRIC FASTENINGS.

OVER 10,000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW. SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE.

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

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„ Gaslight Company, Bow Common.	„ Imperial Gaslight Company.	„ Rochdale Corporation Gas-Works.	„ Merthyr Tydfil Gas-Works.
„ London Gaslight Company.	„ Gas-Works, Arsenal, Woolwich.	„ Liverpool United Gas-Works.	„ Ystrad Gas-Works.
„ Independent Gaslight Company.	„ Commercial Gas Company.	„ Birkenhead Gas-Works.	„ St. Alban's Gas-Works.
„ Phœnix Gaslight Company.	„ Alliance and Dublin Gas-Works.	„ Birmingham Gas-Works.	„ Over Darwen Gas-Works.
„ South Metropolitan Gaslight Co.	„ Edinburgh Gas-Works.	„ Nottingham Gas-Works.	„ Aylesbury Gas-Works.
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"Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them, and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) "F. J. EVANS."

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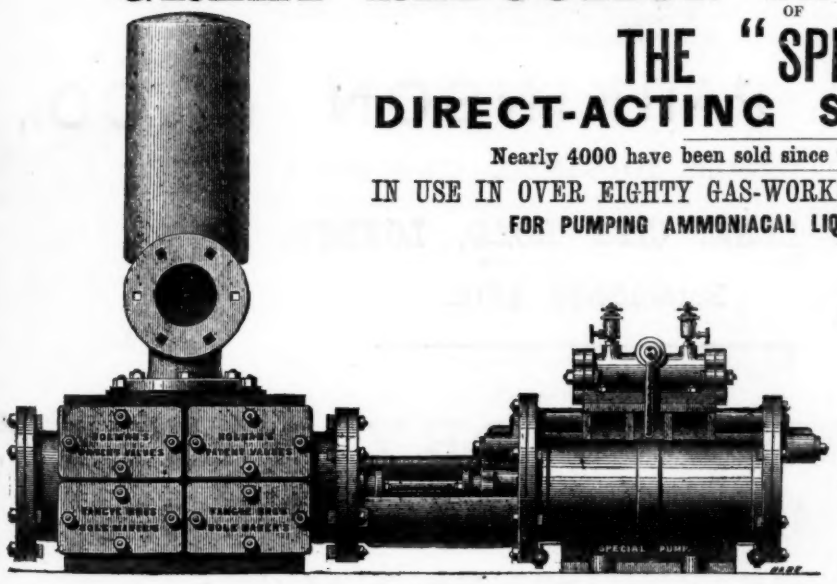

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Diam. of Suction & Delivery „	1	1¼	2	2	3	3	3½	3½	4	4	5	5	6	6	7
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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 2, 1874.

Circular to Gas Companies.

While waiting for the views of the Metropolitan Board of Works with regard to the future gas supply of the metropolis—information which we expect to gain from the discussion on the resolution to be submitted by Mr. Fowler at the next meeting of the Board—we may refer to the Metropolis Water Supply and Fire Prevention Bill, brought into the House of Commons by Major Beresford and others. A measure of this kind possesses as much interest for the gas as the water companies. The object contemplated by the Bill is a simple act of spoliation, and, as such, the measure will soon be disposed of by the House of Commons. Not even the proposers can expect it to pass into law, and, when they have discharged their claims to popularity by supporting a second reading, they will probably allow the measure to fall into oblivion.

Strictly speaking, the Bill is to effect a compulsory purchase of the companies by Government. A body of commissioners are to be constituted by Order in Council, who are forthwith to give notice to the water companies that their property will be confiscated on a certain date; and, thenceforward, the commission shall have, and may, on their own behalf, exercise and enjoy all the statutory and other rights, powers, and privileges of the several companies. As compensation, the commission are to provide for each shareholder a perpetual annuity equal in amount to the annual dividend paid to him on the average of the previous five years, or, if his shares are of recent issue, on the average of the years they have been issued. The due payment of these annuities is to be guaranteed by the Treasury, each certificate being countersigned by an officer of the Treasury. The money necessary for the payment, when wanted, is to be taken from the Consolidated Fund, but the commissioners are to repay the Treasury with interest if, and when, they can. The promoters, having in view the possible constitution of a metropolitan Corporation, have further provided that such Corporation shall become the guarantors of the annuities in lieu of the Treasury, and in such a manner as the Treasury may direct. As compensation to directors, they are to be paid, at their option, either a lump sum equal to their aggregate emoluments during the four years next before the transfer, or an annuity for five years, if they have the luck to live so long, equal in amount to their average annual emoluments in the preceding three years. Officers not retained in the service of the commission are to be compensated on the usual terms, and the commissioners may give gratuities equal to three months pay to weekly servants discharged. It should have been said before that special arrangements are to be made in the case of the New River Company.

The above are precisely the terms on which some people are foolish enough to think that the metropolitan gas companies may be bought up. It is supposed that if a current rate of dividend be guaranteed, it is all that a shareholder can reasonably expect. We may say at once, however, that such terms a company can never accept, nor will they ever be sanctiond until we get a Parliament utterly without respect for vested interests and the rights of property. The water companies may be bought, as we said last week the gas companies may be, but the purchase can only be made on equitable terms, and such as are proposed in this Bill no Corporation has ever had the impudence to offer. They would be rejected by any tradesman having a business to dispose of, increasing in value every year.

It is needless to discuss further a measure which neither deserves, nor will receive, much consideration. What it is proposed the commissioners shall do in relation to the supply of water will be mentioned in another column. We only refer to the matter here to show the gas companies what may possibly be proposed for them.

The small gas undertaking of the Local Board of Blackpool continues to be profitable, even under the adverse circumstances of the past year. Coals cost on the average 24s. 6d. per ton, or 3s. 6d. per ton more than in the previous year. But it seems that at Blackpool, coke fetched a better price, and the amount of unaccounted-for gas having been largely reduced, the profits have been fairly maintained. After the payment of interest and sinking-fund, there is on the year's working a net balance of £1700 in favour of the town.

The Corporation of Ryde have not yet got out of the difficulties they brought themselves into by not completing the purchase of the gas company. They are still incurring legal expenses, and promise to go on doing so, unless everything is decided as they wish, reckless as to how these expenses are to be paid. The members of the old Corporation are still responsible for some of the costs they incurred, and show no disposition to cash up. They want the present Corporation to go to Parliament and get them relieved of their liabilities, and have the town saddled with the expenses. The present mayor, however, tells these unfortunate gentlemen that there is no chance of success in Parliament unless they pay down something in the way of compromise. That being done, the Corporation may apply to Parliament, but the mayor evidently is not hopeful as to the result. The judge's decision in the case of Mr. Thornton Andrews is expected shortly, and in one event the mayor sees looming another seizure of the goods and chattels of the Corporation. A snub, too, is administered by the Local Government Board. The Board will sanction the borrowing of the money required to pay for the new lamp-columns, but only after a distinct promise that in future the requirements of the law with respect to the payments of money borrowed be strictly complied with by the Corporation, hitherto somewhat remiss in this particular. Even then the Board cannot recommend the Public Works Loan Commissioners to advance the money. The Corporation must get it where, and at what rate of interest, they can. Altogether, it is not a pleasant time for the Corporation of Ryde.

A Patent Gas Economizer Company is advertised. The object is to work the invention of Mr. R. Seegers for the carburation of coal gas by the vapour of light petroleum oil. The peculiar feature in the apparatus—and this, in principle, is not novel—is that the gas is caused to pass in succession over three surfaces of spirit, so that it may become thoroughly charged with the vapour. Fixed over the apparatus is a reservoir containing the oil, which, by an automatic arrangement, is maintained at a constant level in the carburettor. The promises of the advantages to be derived from the use of these apparatuses are of the usual extravagant character. An expectation is held out that the consumer who adopts one will get double the amount of light for half the consumption of gas. All this and more has been promised before by so many carburettors which now lie about in lumber-rooms, or have been sold for old metal, that we do not think gas companies need have any fear of a diminished consumption of gas. The working results with these apparatuses have never yet borne out the results obtained in experiments, and we see nothing in this invention which would lead us to expect a better effect than has been obtained with half a dozen others now forgotten. It is only fair to say that the arrangement by the patentee with the company shows every confidence in the perma-

nent value of his invention, and that the financial proposals of the directors are exceedingly modest. To prevent misunderstanding, we may as well remark that we do not regard inventions like this as inimical to the interests of gas companies. Anything that cheapens gas, whether an improved burner or a carburettor, tends practically to increase consumption, and if such inventions as this were generally adopted, and found to fulfil all their promises, we believe the aggregate consumption of gas would be increased rather than diminished. We are bound to add that the appearance of one establishment in which the invention is said to be in use (we made no inquiries) did not impress us favourably. There may be a saving of gas, but there is most unquestionably a great loss of effect, as any one will observe who compares the light in one public-house with another in close proximity.

WATER AND SANITARY NOTES.

The Bill to effect the confiscation of the water companies, referred to in another place, is also intended to confer on the metropolis the blessings of a constant supply. Among the duties prescribed for the commission who are to take possession of the undertakings are the following:—To put the works into a condition for maintenance of constant supply at high pressure; to provide and place hydrants, with apparatus for high pressure supply in case of fire, &c.; to provide and fix apparatus for cleansing and watering the streets, &c. No one is to be consulted—London is to have at once a constant supply at high pressure. There is, however, a very important concession to the obstructive vestryman, the owner of poor property—the commission, if they think fit, may defray the expense of providing fittings, &c., in houses whereof the rental is less than £ (?) without requiring payment by occupiers or owners. In the case of houses of a better class, we may assume that owners and occupiers would receive a summary notice to have them fitted for a constant supply. The regulations made by the water companies will remain in force, so we know exactly what would be required and what we may be sure would be strictly insisted upon. Since the commission are to succeed to all the rights, powers, and privileges of the companies, it is not easy to see what advantage, beyond the constant supply which he may have now, the consumer is to derive from the transfer. He is, in fact, unless an owner of poor-class property and therefore considered entitled to have the value of his house increased at public expense, entirely overlooked. The practically irresponsible commission would levy water-rates, and we may be certain that they would not be less than they are now; but there is nothing that we can see in the Bill to protect the ratepayer. It is unnecessary to speculate on what would happen if the Bill passed, because it will not be listened to. The Government are never likely to make the water supply of London a permanent charge on the Consolidated Fund, as it would be certain to be in the hands of a commission such as this Bill proposes. More than that, people who think over the matter are becoming daily more alive to the fact that London is, after all, as well supplied with water as any city in the world, and may reasonably doubt whether any change of ownership would improve the matter. Those anxious for a change had better expend their energies in promoting the constitution of that metropolitan Corporation which alone can deal with the gas and water supply in the name and on behalf of the ratepayers.

The borough of Tynemouth is badly off for water. For a population of nearly 40,000 the present daily supply is only about 350,000 gallons, or 9 gallons per head. The "constant" service is limited to six hours per day, and the Corporation baths and wash-houses are only opened three days a week. Further than this, the water, though wholesome, is excessively hard, averaging 40° of Clark's scale. The water company are doing their best to augment and improve the supply, but the anxiety of the Town Council on the subject is natural, and they have called in Mr. Bateman and Mr. Fenwick to report as to the present and prospective supply of water to the borough from the resources at the command of the water company, and in the event of the prospective supply being deemed insufficient, as to the most efficient way of obtaining a satisfactory supply. The reporters find the "sources of the company altogether inadequate to supply the "wants of the district;" and, as might be expected, they strongly condemn the water. Mr. Bateman is the advocate of a soft water supply, and we find in this report the assumption that the substitution of soft for the present water would result in the annual saving of soap alone to the value of 4s. per head, which is probably more than the average inhabitant of Tynemouth ever expended on soap in a year. It may, however, be admitted that the use of a water of over .30° of permanent hardness must be wasteful. The scheme proposed by the reporters is a gathering-ground on the Northumberland hills, 28 miles distant from Tynemouth. The objection to it is the cost, estimated at £300,000; but the report states that Morpeth and Bedlington, and colliery villages, might be supplied on the route. It seems, however, that the Newcastle and Gateshead Water Company intend to apply to Parliament next year for powers to make such an extension of their works as would tend to supply all the wants of Tynemouth for years, and the reporters candidly admit that "such a supply would be found a cheaper, and, in "that respect, a more satisfactory one, than the independent "scheme they have sketched out." Under such circumstances, the course to be pursued by the Tynemouth Water Company and the Town Council appears to us clear. The former could, of course, make terms with the Newcastle Company; and the latter may gratefully accept a better supply which relieves them from the necessity of incurring a debt altogether disproportionate to their means.

The water-works of the Corporation of Hull have not yet been put in order, and the town is still short of water. It now appears that the Corporation have been repeatedly warned by Mr. Dale, their own engineer, and by others, of the necessity for a duplicate engine at Springhead; but, as the water supply involves a considerable annual loss, they have persisted in a foolish, and, as it now turns out, a very expensive economy.

The opposition to the Wakefield Water Bill in the House of Lords is likely to be much stronger than in the Commons. Several peers, it seems, are likely to petition against the Bill, in addition to the millowners and the Corporations who have already joined in the opposition. The prospects of the Bill, it must be confessed, are not good, but the admitted urgent necessity for providing a better water supply for Wakefield may possibly weigh with their lordships in deciding the fate of the measure.

The Board of Guardians of Brentford, who constitute the "rural sanitary authority" of the district, have just perpetrated what we cannot help thinking a bad joke. In consequence of a peremptory notice from the Thames Conservancy Board, they have just issued a notice which practically requires the owners or occupiers of all houses which are now drained into the river Crane to provide cesspools within one month. The object, probably, is to cause such an uproar in Brentford as will induce the Conservancy Board to withdraw their order. We venture to surmise that no such result will follow. The Brentford Guardians must find another solution of the difficulty. There can be no obstacle to the proper drainage of the district, and the application of some system of purification which will satisfy the Thames Conservators.

A very thoughtful address has been published by W. H. Michael, Esq., on the Public Health Act, 1872: its Defects and Suggested Amendments. We may defer a notice of it until we have seen the Bill "to amend and extend the sanitary laws" which Mr. Sclater Booth is introducing to the House of Commons as we go to press. In the meantime, any reader who desires to know the views on the subject entertained by a very able and experienced lawyer, who has ample acquaintance with the administration of the sanitary Acts, will do well to peruse the pamphlet.*

Our attention has been called to a matter which, though not very germane to our specialities, may deserve a word of notice. The fire insurance offices have a practice of charging varying rates for the insurance of mills, according to the kind of oil used for lubricating purposes, the risk considered being that of the spontaneous combustion of cotton waste saturated with oil. The odd thing, however, is that no extra rate is charged where olive or Gallipoli oil is used, while an extra rate of £1 1s. is imposed where mineral oil is employed for lubrication. Now it is just the first-named oils which are most dangerous; with the latter it is impossible that spontaneous combustion can occur. Practically the regulations of the fire offices compel the manufacturers to use the dangerous oils, and they may thus cause the fires they would appear designed to prevent. It might be thought sufficient to point out the mistake to the offices concerned; but the matter has been before them now for several months, and while we believe one or two of the London companies have altered their rates, the bulk, guided by the rules of the northern fire offices, still adhere to those which prohibit the use of a safe material, and encourage the employment of a dangerous one.

True to instinct and tradition, the Common Council of the City of London—for the Commissioners of Sewers are only a committee of that body—have, it would appear from the speeches of some of their number, resolved on the perpetration of a job. They are going through the farce of advertising for a medical officer of health and an analyst, with the knowledge that the promises of the majority have been given to one of their own body. We have nothing to say respecting the merits of the reputedly chosen candidate; but we protest against the practical insult offered when an appointment already given away is advertised. The City appointment is, in some respects, the most important in the kingdom, and it says little for the honour and

* The Public Health Act, 1872: its Defects and Suggested Amendments. By W. H. Michael, Esq. London: Roworth and Sons. 1874.

credit of the Corporation that a candidate should be selected before it was known what others might come forward. But if the first sanitarian in the kingdom (whoever he may be) had presented himself, we presume his claims would have weighed as nothing against the claims of private friendship and good fellowship.

THE SEWAGE OF BRENTFORD.

Our readers are doubtless aware that during the last 12 months the Conservators of the Thames have been very vigilant in reference to the existing causes of its pollution by sewage sent into it by various places above the metropolitan area. Outside of the jurisdiction of the Metropolitan Board of Works, the sanitary authorities, created by the Local Government Acts, are responsible, and consequently Richmond, Twickenham, Kingston, &c., have received legal notices to stop the flow of sewage into the Thames from the Board of Conservancy. But for the present we only wish to draw attention to the case of Brentford, which presents some of the most curious—and even ludicrous, were they not serious—features which sewage history has yet developed. Brentford may be described as a long, straggling district, occupying throughout its length the bank of the Thames. Part of its sewage falls directly into the river, and the remainder passes into the Crane, which is a tributary of the Thames.

Very recently the Conservators have given notice to the guardians, who constitute the "rural sanitary authority" of the Brentford Union, that all sewage, or any other offensive matter, must cease to flow into the Crane or other watercourse, or into the Thames, by the 22nd of November, 1874, being the date of a twelvemonth's notice expiring on that day. We are aware that the Brentford authorities have been greatly troubled as to what they should do, as, for some time past, between schemes of irrigation and precipitation, they have been enabled to arrive at no definite conclusion, and in fact have hitherto done literally nothing. Being sorely pressed, however, they have resorted to the pen, and have issued the following notice to the householders:—

Brentford, May 23.

Sir,—The rural sanitary authority having been served with a notice from the Conservators of the river Thames, within 12 months from the 22nd of November last, to discontinue the flow or passage of sewage, or any other offensive or injurious matter into the river Crane, or any stream or watercourse communicating therewith (which said river Crane flows or runs into the Thames), and it appearing that sewage or other offensive matter runs into such river, drain, or watercourse connected therewith, from certain premises in your occupation or belonging to you, I do hereby, on behalf of the above-named rural sanitary authority, give you notice within one month from this date to discontinue, by diversion or otherwise, the use of any sewer or drain, directly or indirectly connected with the said river, or any stream or watercourse communicating therewith, for the passage or flow of sewage, or any other offensive matter of or from the premises in your occupation or belonging to you.

The letter is signed by the clerk to the rural sanitary authority, and is certainly one of the most astonishing productions which could emanate from even a Local Board. It plainly intimates that all water-closets, sinks, and other household contrivances for getting rid of liquid refuse, must be closed, or, in fact, that each household must become its own sewage consumer. The only resource left is the digging of cesspits into which such refuse must be cast, to putrefy in the heat of summer, and to become hotbeds of fever.

The ludicrous aspect of the case is that in the metropolis, of which Brentford naturally, although not legally, forms a part, the existence of a privy or cesspool is illegal, and would be followed by the infliction of heavy penalties. It would appear that the work of years, on the part of engineers and chemists, can be set at defiance, and brought to nought, by the action of a petty Local Board, whose ignorance or laziness has led them to one of the most mischievous and ridiculous contrivances to evade an imperative duty. If Brentford is to be a specimen of the manner in which the provisions of the Local Government Acts are to be carried out, it is high time that Parliament should take the matter in hand, and either extend the provisions of existing Acts, or define more accurately the powers already given to promote sanitary arrangements.

One phase of the case is very serious. If the Brentford authorities can legally take the step they have initiated, what may we expect of Local Boards in country places, whose action would scarcely reach the public ear or eye? The temptation to follow their example would be very great, and comparatively little fear of detection or criticism would exist. If, however, we have to revert to the old system of privies, &c., it may be at once considered that all the efforts to improve our sanitary condition will prove abortive, and, consequent on the great annual increase of population, the evils we have already suffered from will be intensified to an extent that must be followed by most serious results. We cannot believe, however, that the Local Government Board will permit such a state of things, and we sincerely hope that it will take such steps as will suffice to bring the Brentford rural sanitary authorities to their senses. We had some suspicion that if "guardians" were allowed to become "sanitary authorities" there would be an endless amount of stupidity and wilful ignorance exhibited, and the present case more than justifies our prognostication.

THE INTERNATIONAL EXHIBITION.

(Sanitary Department.)

Third Notice.

In our issues of the 21st and 28th of April we gave respectively an outline of the various chemical processes that have been brought forward and patented for the utilization of sewage, and the various methods that have been suggested for the dry treatment of excreta, as illustrated at the International Exhibition at South Kensington. At the time of our first visit, the chemical processes were not in operation; but, since, two of them have been completed, and may be seen at work between two and five p.m., near the Machinery Department.

The A. B. C. process will not be exhibited in action, as the directors of the Native Guano Company were not able to complete their arrangements within the specified time. Dr. Anderson's process is simply illustrated by means of diagrams and a model of Latham's sewage extractor, which is employed at the works at Coventry, recently opened. There are, therefore, left only two of the processes—the Phosphate and General Scott's—at work; but of two others we shall offer a brief description.

The Phosphate process is illustrated in a neatly-constructed shed, having the addenda of tanks, surrounded with ferns, plants, &c., into which the effluent passes. After the sewage has been treated with the phosphate of alumina and milk of lime, it is received in a glass tank, where it is allowed to settle. Thence it passes into a filter filled with coke, through which the effluent percolates. It passes out of this perfectly clear, bright, tasteless, and inodorous; and consequently, so far as a model can show the efficacy of a process, the result is very satisfactory. On the other hand, however, we may state that no analysis is given of the sewage employed or of the effluent produced, nor of the quantity and cost of the materials used. Consequently, no practical result can be drawn by the inspection of the model works.

These latter observations equally apply to General Scott's process, already described in our issue of April 21. The effluent of this process, working on the same sewage as that employed by the Phosphate Company, is decidedly inferior. But General Scott's method is chiefly characterized by the mode through which he gets rid of the deposit. As already stated, he converts it, by self-combustion, into a cement said to be equal in quality to Portland cement. Specimens are exhibited of the dried sludge in the form of bricks, of the burnt sludge, of the cement thus produced, and also of the cement pressed into a brick-like form.

Some time ago the Bradford authorities were in considerable difficulty—as are most other Yorkshire corporations—in respect to the disposal of the sewage. At Bradford this is generally of a black colour, owing to the large amount of dye-stuff waste from the woollen manufacture. The Peat Engineering and Sewage Filtration Company eventually agreed to treat this sewage. Specimens of it, and of the effluent resulting from such treatment, are now in the Exhibition. The effluent is quite clear, the amount of suspended matter being trifling. As the bottles containing it were closed, we had no chance of judging how far it is tasteless or inodorous.

The Carbon Fertilizer Company exhibited the results of their process close to the erection of the Phosphate Company. They employ charcoal, either from seaweed or animal refuse, and apply it to a dry closet system, or for the purification and utilization of sewage. The secondary source of the charcoal is the human excreta. Seaweed, peat, or other charcoal is employed to commence the process. After the closet-pans have been emptied, their contents are distilled in iron retorts, and afford ammoniacal liquor, tar, and gas. From the liquor, sulphate of ammonia and acetate of lime are obtained. The residual charcoal is now fitted for another closet absorber, and at every returning it gathers more of the animal salts, which are not volatile, becoming at last rich in phosphates, &c. In this form it is stated to be eventually worth £5 per ton as a manure, but, if mixed with the sulphate of ammonia already produced, is said to have a value of £10 per ton. The company recommend this charcoal as an excellent filtering material for treating raw sewage, on account of its porosity. The repeated use of the charcoal, as above described, has led to the adoption of the name of "Cycle Charcoal."

We may briefly state, in conclusion, that the whole of the exhibits in the sanitary department are characterized by little freshness of design or novelty of invention. Improvements are visible in some cases, but such are the exception rather than the rule. Little can be learned from the entire department, even by those initiated into the subject, and those who have not that advantage can scarcely gather even a guess as to what is intended by the articles exhibited.

We are not at all surprised that the commissioners have resolved that this shall be the last of annual exhibitions. In fact, it would have been much better to have killed them some time ago, than to have allowed them to commit suicide by sheer inanity.

Important Decision under the Adulteration Act.—A decision of Justice Blackburn, on Saturday, has rendered an amendment of the Adulteration Act inevitable. A grocer at Birkenhead was proceeded against for selling adulterated green tea, the adulteration being the facing of Prussian blue and clay put on the tea in China. It was proved that the tea was sold exactly as it was received from China, but the magistrates convicted. On appeal, the conviction has been confirmed. The prosecution was a discredit to all concerned in it, but Judge Blackburn's decision will lead to an immediate alteration in the law under which it was possible.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XVI.

The Analysis of Coal.

The complete analysis of a coal requires for its satisfactory performance a considerable amount of skill and experience in chemical operations, but a brief account of the methods employed in arriving at the results given in the tables (p. 728) may properly find a place in this work.

1. *Specity Gravity.*—The specific gravity of a body expresses the relation which exists between the weights of equal bulks of one substance compared with another chosen as the standard. For solids and liquids the standard is pure or distilled water at the temperature of 60° Fahr.; for gases the standard is dry atmospheric air. The mode in which the specific gravity of a gas is determined will be described further on, when treating of the analysis of gas.

Taking the specific gravity of a substance like coal, heavier than, and insoluble in, water, is a very simple operation. A small piece weighing about an ounce is selected, and suspended by means of a horsehair from the bottom of the scale-pan of a good balance. It is then accurately weighed hanging in the air. It is next immersed in water, as shown in the figure, and again weighed. Before the weight in water is taken, any adhering bubbles of air must be carefully removed from the surface. This is easily done by removing the sample from the water after a short immersion, and brushing the surface with a wetted camel's-hair pencil. It can then be returned to the water, and the weighing completed. The difference in the two weights is the weight of a bulk of water equal to the bulk of the coal immersed; hence the weight of the coal in relation to that of water—in other words, its specific gravity—is found by dividing the weight in air by the loss in water. For example:

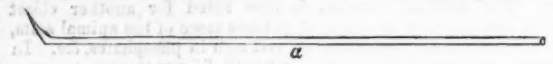
Weight in air	500 grains.
Weight in water	105 „
Difference, representing weight of equal bulk of water	395 „

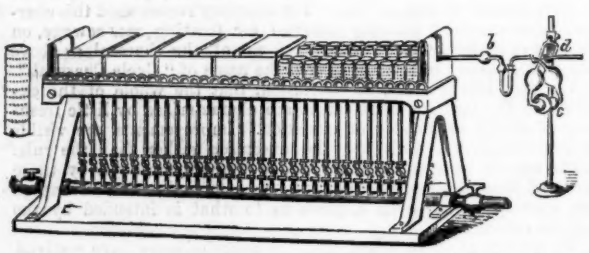
Then $\frac{500}{395} = 1{\cdot}266$, the specific gravity of the coal.

The specific gravity being ascertained, it is easy to calculate the bulk of any given weight of coal. A cubic foot of water, at 60° Fahr., weighs exactly 1000 ounces; hence a cubic foot of the above coal will weigh 1266 ounces, or 77·73 avoirdupois pounds. This being known, the measurement or space occupied by a ton of the same coal is easily arrived at:

$$\frac{2240}{77{\cdot}73} = 28{\cdot}81$$ the measurement of a ton of the coal in cubic feet.

Determination of Carbon and Hydrogen.—In order to ascertain the amount of carbon and hydrogen in an organic compound, it is burnt in combination with a substance which, when heated, gives up oxygen, whereby the carbon is converted into carbonic acid, and the hydrogen into water, the two products being collected separately. In the case of coal, the oxidizing substance employed is chromate of lead, which is chosen for the reason that any sulphur in the coal is converted into sulphate of lead, and therefore does not interfere with the results. The apparatus employed in the operation is first of all a combustion-tube (*a*) of hard German glass, about 20 inches long. This must be made perfectly clean and quite dry. It is then filled for about 14 inches of its length with pure chromate of lead which has been made hot. A sample of the coal having been taken,





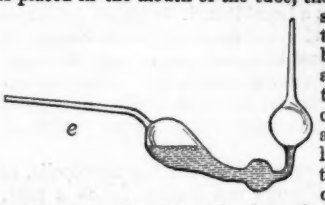
and reduced to a fine powder, about 5 grains are weighed, and very carefully dried at 240° Fahr. About a quarter of the chromate of lead in the tube is then placed in a hot porcelain mortar, the coal is added, and the two are intimately mixed. The remainder of the chromate in the tube, all but a couple of inches, is then added, and the whole mixed and quickly transferred back into the combustion-tube. It is essential that these operations be conducted with neatness and rapidity—with neatness, to prevent the spilling of any portion; and with rapidity, to avoid the absorption of moisture. The mortar is next rinsed with a little fresh hot chromate, which is placed in the tube, now to be filled up to within 3 or 4 inches of its mouth with pure warm chromate. Pure copper turnings are then gently pressed into the remaining space, the object of these being to effect the decomposition of any oxides of nitrogen which may be formed during the combustion. The tube should now be rapped on the table horizontally, so as to shake down the powder, in order to allow a free passage above for the gases to escape, and it is then ready to be placed in the furnace, from which the open end should project about half an inch.

The tube (*b*) containing fused chloride of calcium is attached to the combustion-tube by means of a perforated cork; and with this is connected, by a short piece of india-rubber tube, the series of bulbs (*c*), the three smaller being filled with a solution of potash. The weight of the chloride of calcium tube and the potash bulbs must be accurately determined before they are attached.

Care being taken that all the connexions are sound, the combustion may be commenced by lighting the gas at the burner nearest to the open end of the tube.* As soon as the front of the tube is heated to dull redness, the next gas-tap is opened, and so on gradually, until the whole length is brought to a full red heat. The heating, as we have said, should be gradual, so that the gas evolved may pass away slowly, for if it passed rapidly some might escape absorption.

As soon as bubbles cease to pass through the potash bulbs, the point of the combustion-tube is broken off, and a current of atmospheric air is slowly drawn through the apparatus by means of a suction-tube attached at *d*. In this way the whole of the carbonic acid and aqueous vapour is swept along into the apparatus for their detention. The chloride of calcium tube and the potash bulbs may now be disconnected, allowed to cool, and then reweighed. Any addition to the weight of the former is so much water, and to the latter carbonic acid. Let us suppose the chloride of calcium tube to have increased 2½ grains in weight. This amount of water corresponds to ·2777 grains of hydrogen obtained from the 5 grains of coal. Multiplying this by 20, we have 5·554 as the amount of hydrogen in 100 parts of the coal.† Again, supposing the potash bulbs to have gained in weight 14 grains. This amount of carbonic acid will be equal to 3·818 grains of carbon, which, multiplied by 20, gives the per centage amount of carbon as 76·360.‡ In competent hands, the process just described yields results of the closest possible accuracy, but skill and experience are required in conducting the operation.

Determination of Nitrogen.—In the operation just described, the nitrogen of the coal passes away in the free state; but, as there are difficulties in the way of collecting and measuring the amount, an indirect method of determination has to be resorted to. That actually adopted is to convert the nitrogen into ammonia by a combustion with soda-lime (a mixture of caustic soda with caustic lime). This is effected in a tube similar to the one used in the previous operation, but it may be shorter. The tube, being 12 inches in length, is filled to about 9 inches with dry soda-lime. A portion of this—about a third—is then shaken out into a mortar, and mixed intimately with 10 grains of finely-powdered coal previously dried. More soda-lime is then shaken out, leaving an inch in the tube, and mixed, and the whole is replaced in the tube. The mortar is then rinsed with a little soda-lime, which is added to the contents of the tube, now to be nearly filled with fresh soda-lime. A plug of asbestos is placed in the mouth of the tube, the contents of which are to be shaken down as before, and the tube is then placed in the combustion furnace. The bulbs, *c*, are now connected with the tube by means of a perforated cork. These bulbs are filled, as shown, with some very dilute hydrochloric acid to fix the ammonia evolved. The combustion may be conducted much as in the determination of carbon and hydrogen, but it may be made more rapidly. When the evolution of gas has ceased, the bulbs are disconnected, and the contents separated from tarry matter by filtration. For all practical purposes it will now suffice to evaporate the filtrate in a weighed vessel on a water-bath, and then dry at a temperature not exceeding 230° Fahr., and calculate the nitrogen from the dried residue of chloride of ammonium. For more exact determinations, the ammonia may be precipitated as a chlora-platinate, or the estimation may be made more readily by placing in the bulbs a given quantity of dilute sulphuric acid of known strength, and ascertaining by means of a standard solution how much ammonia is required to complete the saturation of the acid. We will suppose, however, the first and simplest plan adopted, and that the dry residue of chloride of ammonium weighs 0·35 grains. This amount of the salt corresponds to 0·1123 of nitrogen, and, moving the decimal point, we have 1·123 as the per centage quantity in the coal.§



Estimation of Sulphur.—Ten grains of the finely-powdered coal are first mixed with 40 grains of dried carbonate of soda, 80 grains of nitrate of potash and 100 grains of chloride of sodium are then added and well mixed. The mixture is then heated in a platinum crucible until the whole of the coal has been oxidized, which is shown when the mass becomes white. The mass is then dissolved in distilled water, the solution acidified with hydrochloric acid, and the sulphuric acid

* The gas-furnace figured above is that devised by Dr. Hofmann, a full description of which would occupy too much space here. A similar furnace, less costly, has been arranged by Mr. Griffin, and one or the other of these has completely superseded the use of Liebig's charcoal furnace wherever the chemist has gas at command.

† The calculation is as follows:—9 : 1 : : 2·5 : ·2777 × 20 = 5·554.

‡ In this case the calculation is 22 : 6 : : 14 : 3·818 × 20 = 76·360.

§ The calculation is 43·5 : 14 : : 0·35 : 0·1123.

precipitated as sulphate of baryta by addition of chloride of barium. The precipitate is collected on a filter, well washed, dried, and then ignited and weighed. If the precipitate weigh 1 grain, the amount of sulphur in the 10 grains of coal will be 0·1376, or in the 100 grains 1·376. Care must be taken to use pure chemicals in this experiment. Carbonate of soda and chloride of sodium are liable to contain sulphates, which would, of course, vitiate the results.

It is important to the gas maker to know what proportion of the sulphur in a coal is likely to pass into the gas. To ascertain this, the amount of sulphur in the ash must be determined separately and the weight deducted from the whole amount in the coal. The difference will show the weight of sulphur which may be converted into sulphuretted hydrogen or bisulphide of carbon, or other sulphur compounds, in the process of distillation.

Oxygen.—The amount of this element in an organic compound is always estimated by difference; that is, the weight of all other ingredients being ascertained, that required to make up the 100 is deemed to be oxygen. Thus, if the sum of the ascertained weights is 94·25, the amount of oxygen in the coal will be 6·75.

Ash.—The amount of ash is determined by burning 25 grains of the finely powdered coal in a porcelain crucible until the residue shows that all carbonaceous matter has been consumed. The ash should be stirred from time to time with a platinum wire so as to expose every portion to the air. In some cases, and especially with a caking coal, the ash will remain obstinately grey, showing that traces of carbon are still present. In such instances, an oxidizing agent must be employed in order to obtain a pure ash, and the best to use is pure oxide of mercury. A quantity of this is mixed with the ash, which is then again ignited in the open crucible. In this way, a very pure ash may always be procured. The weight of the crucible with its contents is now taken, and that of the crucible alone being deducted, the difference is the ash in 25 grains of coal.

The amount of ash or mineral matter in gas coal, it will be seen in the preceding table, varies from 1 to 20 per cent. The latter and large amount is found in Boghead, and on that fact was based our opinion that it was not a coal but a shale. When thoroughly burnt, the colour of an ash ranges from white to deep fawn, or sometimes a brick red. If it be grey there will always be a suspicion that all the carbon has not been consumed; but it sometimes happens that an ash burnt in a current of oxygen remains grey. The following analysis of the ash of a good Newcastle coal has been given by Mr. Taylor:—

Silica	59·56
Alumina	12·19
Peroxide of iron	15·96
Lime	9·99
Magnesia	1·13
Potash	1·17
	100·00

The silica and alumina are found combined as clay, and are obviously derived from the fine particles of the mud which has become infiltrated in the substance of coal. Much of the peroxide of iron has, no doubt, been formed by the conversion of bisulphide of iron originally present in the coal into peroxide, but some may have been associated with the clay. Lime is generally found in the state of sulphate. Finally, the potash, usually found as carbonate, seems to indicate that some of the mineral constituents of the original plant have remained in the coal. The phosphoric acid which is almost invariably found in the ash confirms this opinion. The ash, however, is of no importance to the gas maker, and need not be further alluded to.

Coke and Volatile Matters.—The amount of coke and volatile matters in a coal is ascertained by exposing 100 grains of dry coal, contained in a covered porcelain crucible, to a bright red heat for about an hour. The loss of weight is, of course, that of the volatile matters, the residue is coke.

The foregoing brief account of the processes employed in the analysis of coal will, we fear, be thoroughly understood only by readers having some knowledge of chemistry. To such the description may serve as a sufficient guide in the conduct of the operations; and, to any reader who is disposed to commence a series of experiments for his own instruction, we need only say that the essentials for the accurate performance of a chemical analysis are care and patience.

(*To be continued.*)

Communicated Article.

THE PRINCIPLE OF THE VALUATION OF GAS COAL.

By D. A. Graham, Stalybridge.

(*Continued from page 360.*)

In a recent contribution on this subject, we endeavoured to review the principles which should regulate the values of gas coal. We there compared the value of a particular coal with others whose illuminating power was assumed to be proportional to the return per ton the coal was capable of producing; this assumption being necessary to prove the deductions drawn from it in the article on the "Depreciation of the Values of Gas Coal produced through Stocking." What follows is an attempt to treat of these principles of valuation irrespective of any such assumption enabling them to be applied more universally to the numerous variety of cases which could not be included under the former supposition.

The proposition may briefly be stated thus: Given the fair market value of a particular coal or cannel, what is the value of any other coal or cannel compared with it viewed as a standard of comparison?

Simple and easy to be determined as such a proposition might, at first sight seem to be, the sequel may show that the data at present known respecting the various qualities of different coals and cannels is altogether too meagre and defective to enable any thoroughly accurate estimation of their values to be arrived at; for although several experimenters have supplied tables and statistics which, in many cases, may enable these values to be determined within very narrow limits of error; there is nevertheless a lack of much of the information requisite to determine these values with almost absolute certainty.

We might here enumerate what we would consider to be necessary to arrive at such a result, and annex the reason, where necessary, for requiring additional information; where it may at present be defective.

The value of a gas coal depends upon the returns per 1000 it will give to the ton, and the illuminating power it is capable of producing upon the quantity and quality of the tar, ammonia water, and coke it is capable of producing, and their freedom from, or their possession of, certain qualities and quantities as shall either enhance or lower their values to the purchaser or user. It is well to know what amount of sulphur, and in what chemical combination or condition, it exists in a coal; but the value of a coke will not be very materially, if at all, affected by the fact that it may contain a little more or less sulphur, while it may be very important to know what amount of sulphuretted hydrogen and carbonic acid exists in the crude gas after it has left the last scrubber, and previous to its entering the purifiers; a knowledge of these particulars would enable the relative costs of purifications to be determined, so that the different amounts of lime or oxide of iron, and the labour requisite to remove or renew them, might be introduced as elements of value, which would either show a coal to be worth so much more or so much less than the coal or cannel with which it was compared.

In experimental work we think it very important that, instead of the amount of ammonia water produced from a ton of coal being simply stated as so many gallons, it should be so many gallons or pounds of a particular strength, say 5° Twaddle, which strength could generally be easily attained by using horizontal condensers filled with tin clippings, such a form of condenser also enabling the whole of the tar and ammonia water to be removed, and ensuring accurate measurements of the quantities of each.

The ammonia water may be produced as a carbonate, or in combination with sulphuretted hydrogen, or other compounds; these, we think, should be tabulated, as they affect the purchases, and their presence may require the use of chemicals to expel the fixed ammonia, which, but for their presence, would not be required, their absence or presence either increasing or lessening their value by the extra amount of labour and material required to produce and liberate them.

When the tar is subjected to redistillation under a variety of conditions of temperature, it should be ascertained whether they contain the benzoles and naphthas, or the anthracine series, each being experimented for at the temperatures most favourable for their production—were this information forthcoming, it would, perhaps, be more easy than is at present possible, to determine the values of these products for different qualities of coal.

In the absence of such results, while it may not be possible to determine these values so accurately as could be desired, we may, nevertheless, proceed to ascertain them as nearly as the information the present methods of analysis have established will allow.

First, then, every district will have its own value for gas coal; it might frequently be more desirable could some other coal be substituted for the one a company, from economic reasons, uses; but it might not be expedient to do so; circumstances therefore determine what it will be most advantageous to do in any particular case; therefore, because in a particular district a particularly good coal may be used, it may take so much to remove it to another distant market, that it may be more economic to use an inferior local one, provided that, all things considered, it is most economical to do so.

Each district will therefore prefer some coal which, to them as purchasers, becomes the standard of comparison, which, while it fixes the values for that district, is perhaps inapplicable to any other.

An Australian coal might be better than a Newcastle-on-Tyne coal for the use of the London gas manufacturer, but unless, all things considered, the Australian can be delivered there for relatively no larger a sum than the Newcastle coal, the superior Australian coal would be rejected. Proceeding then to the principles of valuation—

We know a coal raised in a certain district which produces 10,665 cubic feet of 14·3 candle gas, and 1450 lbs. of very superior coke after the liquor distilled had been reduced by the addition of water after passing through a condenser to a strength of 6° Twaddle, it was found that the amount of tar and ammonia water produced was equal to 18 per cent. of the weight of the coal carbonized, and that the amount of the tar was as 5 to 8, which latter number represented the quantity of the ammonia water.

18 per cent. of 2240 lbs. = 403·2 lbs.

$$\text{And } \frac{403{\cdot}2}{5+8} = \frac{403{\cdot}2}{13} = 31 \text{ lbs.}$$

$5 \times 31 = 155$ lbs. tar.
$8 \times 31 = 248$ lbs. ammonia water.

403 lbs. tar and ammonia water.

If this coal could be purchased for 20s. delivered, which would at present very nearly represent its real value, and coke was worth 6d. per 100 lbs.=11s. 2½d. per ton; tar, 25s. per ton; and ammonia water 15s. per ton—how much was paid for each candle per 1000 produced from this coal?

It will first be better to reduce these several values to a value per 100 lbs.:—

Coke, 6d. × 22·40 = 11s. 2½d. per ton.

Tar, $\frac{25s.}{22·4}$ = 1·116 per 100lbs. = 1s. 1¼d. per 100lbs.

Ammonia, 6° Twaddle $\left\{ \frac{15s.}{22·4} \right.$ = 0·669 per 100lbs. = 8d. per 100lbs.

When the coal was purchased, the tar, ammonia, and coke constituted to the purchaser a portion of its value, equivalent to the amount he would receive for them.

For the profits derived were derived from the sale of gas, and the fact that these three products were purchased along with the coal did not add to profits, they being only so much of the value purchased in one form which could be recovered in another.

	£	s.	d.
1450lbs. of coke, at 6d. per 100lbs.	0	7	3
155lbs. tar, at 1s. 1¼d. per 100lbs.	0	1	8¾
248lbs. ammonia water, at 8d. per 100lbs.	0	1	7¾
Together amounting to	£0	10	7½

20s. – 10s. 7½d. = 9s. 4½d., which was the price paid for 10,665 cubic feet of 14·3-candle gas.

14·3 × 10·665 = 152·4 candles;

and $\frac{9s.\ 4½d.}{152·4}$ = ·74 of a penny, equal ¾d. per candle per 1000 nearly.

Before comparing this result (¾d. per candle per 1000) with those obtained from the price charged for another quality of cannel or coal, it will be necessary to examine into the costs of carbonizing and various other charges, for, as was before demonstrated, the value of a coal is materially affected by the difference in production per ton it is capable of producing. We shall, therefore, proceed with the investigation of the costs of carbonizing, and these other charges, before showing the relation of such values to the cost of the coal, or how such charge may be applied as to affect the valuation.

What then are the working expenses which affect the valuation of a coal when compared with others which give a larger or a less return per ton?

The coke we have valued at 6d. per 100 lbs. = 11s. 2½d. per ton, a value which may nearly correspond with the average values of the sales in some Lancashire districts.

The amount of coke used in a furnace we shall estimate at one-fifth of the weight carbonized, which is perhaps nearly the weight of best coke used in a well-set bed of retorts, being equal to 20 per cent. of the weight of coal carbonized, and would be equal to a weight of 448 lbs. for each ton of coal used, and 4·48 × 6d. = 2s. 3d. for coke used for fuel for each ton of coal carbonized.

The wages for carbonizing, as before stated, would at present amount to 2s. 5d. per ton. Interest on settings was charged at 1s. per ton carbonized, and renewals at 1s. per ton, which charges would, together, form a charge as undermentioned:—

	£	s.	d.
448 lbs. of coke used for fuel, at 11s. 2½d. per ton	£0	2	3
Stokers wages, at 2s. 5d. per ton carbonized	0	2	5
Interest for use of settings, at 1s. per ton carbonized	0	1	0
Repairs and renewals, at 1s. per ton carbonized	0	1	0
Together making a charge of per ton	£0	6	8

But a certain definite quantity of gas had to be manufactured, and it will require a less weight of a rich coal to produce this quantity of gas than if a poor coal were used instead. These working expenses, as a charge upon the 1000 of gas produced, would therefore be proportional to the returns per ton the coals were capable of producing. The following table calculated at this basis of valuation would, therefore, show these differences of the cost of producing 10,000 cubic feet produced from various qualities of coal:—

Cost for Carbonizing, &c., for 10,000 *Cubic Feet of Gas from Various Qualities of Coal.*

Production per Ton.			A Difference of
8,000	8s.	4d.	—
8,500	7	10	6d.
9,000	7	4¾	5¼
9,500	7	0	4¾
10,000	6	8	4
10,500	6	4	4
11,000	6	0¼	3¾
11,500	5	9½	2¾
12,000	5	6½	3

But having found that it costs 6s. 8d. to carbonize and pay these several expenses on one ton of coals, it will be unnecessary to refer to this table, as the charge for these items on one coal, when compared with another, will be inversely as the production per ton. Thus, comparing these costs for a coal producing 10,665 cubic feet and a Yorkshire coal producing 9000 cubic feet, the difference would be 7s. 10¾d. – 6s. 8d. = 1s. 2¾d.

$$\frac{10,665 \times 6·66}{9000} = 7·89 = 7s.\ 10¾d.$$

And, compared with the production of a cannel, which I find Mr. Longworth, of Dukinfield, states, will produce 10,875 feet of 22·75-candle gas, or, adding the candle and a half for the new London burner (as we have done in all these statements) (22·7 + 51·5) = 24·25-candle gas, the difference in values would be 6s. 9¾d. – 6s. 8d. = 1¾d.

$$\frac{10,875 \times 6·66}{10,665} = 6·82 = 6s.\ 9¾d.$$

Proceeding now to estimate the value of a candle in this cannel coal, which would probably sell at 31s., or 30s. delivered—say 30s.—we shall find whether a candle in cannel cost more or less, or the same price as a candle in a coal.

This cannel produces 10,875 cubic feet of 24·25-candle gas, and 1568 lbs. of coke. The production of tar and ammonia water is not stated, but they are very nearly half and half of 18 per cent. of the weight = 201·6 lbs. of tar, and 201·6 lbs. of ammonia water of 6° Twaddle.

Proceeding, therefore, to value these secondary products, in the first instance, we find that—

	£	s.	d.
The coke will be worth 15·68, at 6d. per 100 lbs.	£0	7	10
Tar, 201·6 lbs. at 1s. 1¼d. per 100 lbs.	0	2	2¾
Ammonia water, 201·6 lbs., at 8d. per 100 lbs.	0	1	4
Together worth	£0	11	4¾
And 30s. – 11s. 4¾d. =	0	18	7¼
Deduct the 1¾d. paid for the extra value of the fractional part of the 6s. 8d., the cost of stoking, &c.	0	0	1¾
And the 10,875 cubic feet of 24·25-candle gas will cost	0	18	5½

24·25 × 10,875 = 263·71 candles.

These 263·71 candles cost 18s. 5½d.

and $\frac{18s.\ 5½d.}{263·71}$ = 0·84d. = ¾d. and half a farthing.

Before passing on it will be well to observe the difference between the value of a candle of cannel and a candle of coal in each 1000 cubic feet produced.

The coal was equal 0·74 of a penny.
The cannel ,, 0·84 ,,

So that the cannel candle cost 0·10 of a penny more than the coal candle.

The average cost of the candle in the coal and cannel would be—

$$\frac{0·74 + 0·84}{2} = 0·79 \text{ of a penny.}$$

This would demonstrate that at the prices quoted it would be much cheaper to make gas from a good coal than purchasing a proportionally cheap one to make up its deficiencies of quality by purchasing cannel, and this will be more apparent presently; for if 0·74 of a penny be the price of a candle per 1000 in a coal, and 0·84 be its value in a cannel, when the whole production of each is estimated, it must amount to considerably more, when the difference of the differences be estimated, as was previously shown in the article on the valuation of gas coals, for in the one case we have 263·71 candles of cannel, costing 18s. 5½d., and in the case of the coal, 152·4 candles cost 9s. 4½d.

	Candles.		Price.
Cannel	263·71		18s. 5½d.
Coal	152·4		9s. 4½d.
A difference of	111·31	candles, costing	9s. 1d.

And $\frac{9s.\ 1d.}{111·31\ candles.}$ = ·98 = 1d. per candle.

From which it appears that each candle added by means of cannel coal costs 0·98d., while each candle produced by using common coal costs 0·74d., a difference of 0·98 – 0·74 = 0·24 = ¼d. per candle.

The question, then, is, should a candle of cannel cost more than a candle of coal? We think it should. There is less cannel than coal, and, proportionally, a much greater demand for it, so that we think that when we estimated the deficiencies of illuminating power in this manner in a former article, we did what was consistent with the conditions of the case, and found accordingly.

This cannel produced nearly as good a coke as the best coals would have produced—a quite exceptional circumstance in the qualities of cannel cokes, but one which made it a very fitting article of comparison.

We shall now proceed to value another coal in accordance with these results—a Yorkshire—one producing 9000 cubic feet of 12·5 = 14-candle gas N.L.B., and producing 1427 lbs. of coke. Tar and ammonia water not stated, we shall therefore assume their value to be proportional to the values received for the tar and ammonia water produced from the coal producing 10,665 cubic feet, the tar of which was valued at 1s. 8¾d., and the ammonia water at 1s. 7¾d.

1s. 8¾d. + 1s. 7¾d. = 3s. 4½d.

$$\frac{3s.\ 4½d. \times 9000}{10,665} = 34·2 = 2s.\ 10¼d.$$

	£	s.	d.
Tar and ammonia water	£0	2	10¼
9 × 14 × 0·74d. per candle = value of gas	0	7	11¼
Coke, 14·27 lbs., at 6d. per 100 lbs.	0	7	1¾
	£0	17	11¼
Deduct the extra cost of carbonizing, &c., &c., as before stated, at 1s. 2¾d.	0	1	2¾
From this valuation it appears that this coal would be worth	£0	16	8½

when compared with the coal which cost 20s. and produced 10,665 cubic feet, the value of the candle being estimated at 0·74 of a penny per 1000, showing a difference of 3s. 3½d. per ton.

But as cannel is required to make up for deficiencies of quality, this coal is clearly worth less than 16s. 8½d. by the amount of the difference of the values of—

10,665 cubic feet of 14·3 candle gas = 152·5 candles
And 9,000 cubic feet of 14·0 candle gas = 126·0 „

Equal to a difference of 26·5 candles.

Which difference (26·5 candles), valued at the difference of the values of a candle per 1000 of coal and cannel taken at the previous quotation, 0·98d. − 0·74d. = 0·24d. or ¼d. fully, would show that 26·5 candles × 0·24d. = 6¼d. would have to be deducted from the 16s. 8½d., so that 16s. 2¼d. would represent the relative summer values of the two coals selected.

But this cannel sold for 35s. during the depth of winter, while the 10,665 coal retained its present summer value of 20s., and

$$\frac{5s.}{263{\cdot}71 \text{ candles}} = 0{\cdot}22 \text{ of a penny.}$$

So that the winter's value of this Yorkshire would be (0·22 + 0·24) = 0·46 of a penny, nearly equal one-half of a penny less, which sum multiplied by the difference in candles = 26·5, would show that 1s. 1½d. had to be deducted from the 16s. 8½d., leaving 15s. 7¼d. to represent the relative winter's value of this coal, and showing a difference of value equivalent to 4s. 4½d.

20s. − 15s. 7¼d = 4s. 4¾d.

(To be continued.)

Correspondence.

SOLID MATTER IN GAS.

Sir,—As your Journal is the medium of instruction to a numerous class of readers, any erroneous scientific observations, made by a leading member of the profession and inserted therein, if left without contradiction, may mislead those it is intended to guide; therefore, with a view of avoiding this, at least in one instance, I beg leave to trouble you with the following observations:—

According to the report, in your columns of the 12th of May, of the proceedings of the New Gas Company, Mr. Spice is represented to have said: "You must have some solid matter to enter into the composition of gas, therefore we pass the *gas* through hot retorts, not only charged with iron, but coke; and with the gas is carried away so much solid matter."

I assume the word gas, in italics, to be an error, and that steam was intended (otherwise, no sense can be made of the observation), which steam is decomposed by the action of the incandescent iron and coke, and converted into compound gases; but in the operation no part of the iron is "carried away;" on the contrary, the iron absorbs the oxygen, so permitting the hydrogen to pass off. Nor is the carbon, or "solid matter," as Mr. Spice terms it, which enters into the composition of the gases of the least advantage; but directly the opposite, as it produces impurities of the worst kind, the inevitable evil of this process of manufacture.

Mr. Spice is likewise in error when he claimed, on the same occasion, originality in first producing the gases, then intermixing them with the spirit of petroleum, as will be seen on referring to Donovan's patent of 1830, wherein he proposes to produce gas by the action of steam on coke, &c., heated to redness, and to bring it into contact with the liquid or vapour of spirit of turpentine, spirit of vegetable tar, coal naphtha, naphthaline, or similar substances, heated or otherwise, and employing the combined mixture as an illuminating agent. Engineer.

FOUL LIME AS LUTING.

Sir,—I should be very much obliged to any of your readers who would have the kindness to inform me whether they make use of foul lime as luting for retort-lids, and whether this was done prior to 1869, and for how long. Granville H. Forbes.

Broughton Rectory, Kettering, May 25, 1874.

IMPROVEMENT IN STREET LANTERNS.

Sir,—Your correspondent, Mr. Ohren, is, I think, right in considering the glass-top lantern an improvement upon the old-fashioned tin-top lantern, but I cannot agree with his remark that "no" light "thrown up from the burner" is lost. In open places, certainly, half the light produced—viz., that radiating upwards—passes uselessly away into space, while in streets only a small portion of it is utilized in lighting the house fronts. If Mr. Ohren will inspect the catoptric lamps in Cheapside, he will, I think, admit that it is possible to use these new reflectors with advantage, and without diminishing, to any appreciable extent, the illumination of the house fronts; and your correspondent, Mr. Walker, would be satisfied to find that the waste of light to which he referred can, by these catoptric lamps, be practically remedied.

37, Essex Street, Strand, May 26, 1874. T. A. Skelton.

LOW PRICE OF COKE AND LEAKAGE.

Sir,—As a neighbour, who suffers pecuniarily from the low price of coke at Cambridge, might I be allowed to remind Dr. Phelps and his excellent coadjutors that one way to increase the price of coke is to reduce the quantity for sale?

I have frequently found that gas companies have from 14 to 20 per cent. more of coals than there is any occasion for, and, consequently, have to throw that extra per centage of coke on the market to their own and neighbours detriment.

If Dr. Phelps and brother directors still convey gas either in brick drains or very old iron mains, they cannot deliver much over 7000 feet per ton carbonized, whereas they might sell, were their mains in good order, nearly 9000 feet, and save from 1000 to 2000 tons of coals per annum.

In most cases there are objections to overhaul the mains, but the principal ones are—first, when the company divides 10 per cent., and will not expend the money; secondly, when it is a poor one, and would expend it, but cannot.

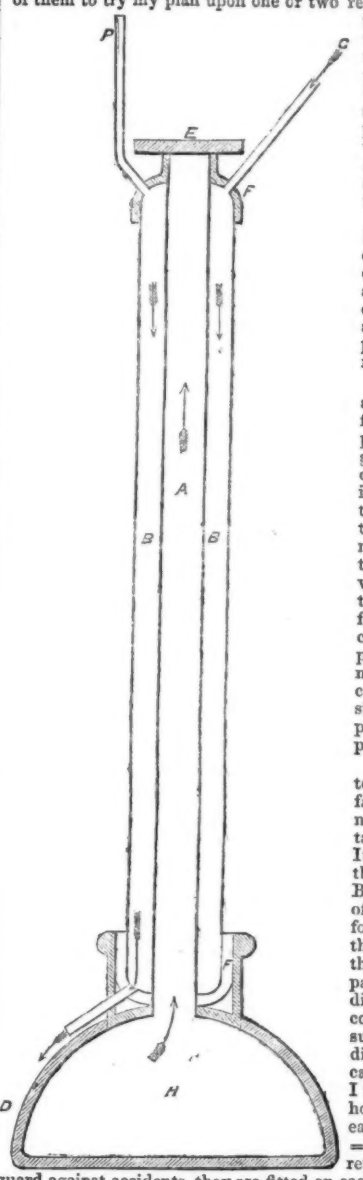
The first class are beyond the reach of argument, and the second, in which the Cambridge Gas Company will remain for some time, might be assisted by contractors, who would find the money and take the payment, as the improvement provides the funds.

Should any company desire an introduction to a first-rate firm who will repair their mains on such easy terms, to produce the results indicated in my article on leakage, I shall be happy to give them one, and thus remove the only obstacle with which they have to contend.

As I have given Dr. Phelps and his coadjutors credit for 400 feet more per ton than are delivered by some companies who have figured in your parliamentary reports, I trust that they will not consider me too hard on their management; for it is quite possible to be very well acquainted with the siege of Troy (provided there was one), and be some way behind in the distribution of gas and sale of coke. And, if they have no regard for their own interests, pray let them have some pity on their suffering neighbours, who, for years past, have lost customers and money by the sale, in their district, of thousands of tons of coke which never ought to have been made. Thomas H. Methven.

STOPPAGES IN ASCENSION-PIPES.

Sir,—At this time of the year, when gas engineers are preparing for the ensuing winter, a few remarks on one of the difficulties with which, in the course of their operations, they have to contend, may induce some of them to try my plan upon one or two retorts. I am not in a position to carry out my ideas, or would gladly furnish you with the result instead of troubling you with the description of an apparatus which I feel sanguine would be found practicable and beneficial in works situated near a river or canal, whence an abundant supply of water could be obtained.



The remedy for stoppages in ascension-pipes is a vexed question in the profession. I do not think this is a wrong appellation, seeing that it has engaged so much attention, and gas engineers have expressed such various opinions respecting it.

It is very evident that there are two evils to contend with; first, high heats, which cause particles of matter to take a gaseous form, and these becoming condensed before passing the bridge or H pipe, trickle down the ascension to that part where the heat is not high enough to convert them again into a state of vapour or gas, but high enough to bake them. They there form a ridge, and their accumulation soon stops the pipe. The remedy appears to me to be either to form a condenser round the ascension-pipe, or to make that pipe of a non-conducting composition.

The next evil to be contended with arises from the fact that these stoppages do not take place at equal distances from the mouthpiece. It may be said in explanation that the heats are not all equal. But take for instance a bed of seven retorts, and it will be found that in the two tops, the two outside middles, and the two bottoms, the stoppages are not at the same distance from the mouth. I consider that in a great measure this is the fault of the dip-pipes; there is not proper care taken in fitting them up. I take, for example, a retort-house, with three divisions, each division with 9 beds = 27 beds, each bed with 7 retorts = 189 retorts. As a guard against accidents, they are fitted on each side with ascension-pipes and hydraulic main; but I will only take notice of one side, where an 18-inch main receives the make from the hydraulic. The area of an 18-inch main is 254·469 square inches, which is = 1·34 square inch to each retort. The ascension-pipes are 5 inches in diameter = 19·63 square inches to each retort. I should reduce the ascension-pipe from 5 inches to 3 inches—that would be 7 square inches to each retort; and for lightness and simplicity, I should use wrought-iron pipes. Each retort would require two reducing-pieces from 5 to 3 inches, one to be fastened into the socket of the mouthpiece, the other for the top of the ascension-pipe, F. By screwing the 3-inch and 5-inch pipes into the reducing-piece in the mouthpiece, H, a chamber, B, is formed, through which the water is to pass. A is the ascension-pipe; C is the inlet for the water from an overhead water-main; D the outlet into water-main to supply the works, as all the water used in the chamber might perform two duties. If it should be too warm, some of it might be allowed to run into the river or canal, so as to allow the water to pass through the water-chamber or condenser faster. P is a pipe, carried higher than the water-tank, for a vent in case of a stoppage, bearing in mind that fire and water are good servants but bad masters.

London, May 21, 1874. Chas. A. Mackenrot.

Parliamentary Intelligence.

HOUSE OF COMMONS.

FRIDAY, MAY 15.

(*Before Mr.* BENYON, *Chairman; Mr.* FRESHFIELD, *Mr.* WILSON, *and Mr.* DAVIES.)

EDINBURGH AND DISTRICT WATER BILL.

Mr. DENISON, Q.C., Mr. RODWELL, Q.C., Mr. CLERK, Q.C., and Mr. POPE, Q.C., appeared for the promoters; Mr. VENABLES, Q.C., the Hon. GRANVILLE SOMERSET, Q.C., and Mr. SHIRESS WILL, Q.C., for the Mid-Lothian Water Company; Serjeant SARGOOD, with Mr. SHIRESS WILL, for ratepayers of Edinburgh; Mr. LITTLER, Q.C., and Mr. LOCH, Q.C., for Mr. W. J. L. GILMOUR; and Mr. R. CAMPBELL, for the Edinburgh and Leith Wine, Spirit, and Beer Trade Association.

At the sitting of the committee, Mr. VENABLES made an application for a postponement of the case in order that his clients might have the opportunity to petition against certain new clauses, of which they had that morning only had notice, and which, so far as his clients were concerned, entirely altered the character of the bill. If any delay was the result, it was entirely the fault of the promoters, who ought to have introduced the clauses before, so that the objectors might have had an opportunity of petitioning against them. He appeared on behalf of the Mid-Lothian Water Company, and Mr. Wardlaw Ramsay, of Whitehill, who had presented a petition against the bill. Mr. Wardlaw Ramsay was a landowner, whose property was interfered with, and he got a *locus standi* as such. The *locus standi* of the Mid-Lothian Water Company was objected to, and the referees only allowed it in regard to the 24th and 29th sections of the bill, and such facts as related to those clauses. The 24th section defined the area of compulsory supply, and the complaint of the Mid-Lothian Company was that included in it were certain parishes which were in their districts. The 29th section gave unlimited power for selling water without any places being defined. Mr. Wardlaw Ramsay alleged that the quantity of water was insufficient.

Mr. DENISON had not the least objection to his learned friend complaining of the new clauses. The fact was that all the landowners had been settled with except one, and there was no wish to stop his learned friend being heard. He was himself thoroughly conversant with the alterations on the bill, and consequently there was no need for any postponement. The only object of the application, he had no hesitation in saying, was delay.

After some further conversation, the committee consulted, and

The CHAIRMAN stated that they were of opinion no sufficient reason had been shown for adjournment.

Mr. DENISON then proceeded to state the case for the promoters. He said the object of the bill was to supply Edinburgh and district with water, and the source they proposed to get it from was the Moorfoot, including the South Esk and Glencorse Valley. Edinburgh had been crying out for water since 1868, which, as they would remember, was a year in which everybody's water supply was severely tested; and in 1869 there was an attempt made by the corporation to get an additional supply from St. Mary's Loch. At that time the supply was in the hands of a company, and the bill of the corporation had for one of its objects to transfer it to a body of trustees, who were to represent not only Edinburgh, but also Leith and Portobello. The St. Mary's Loch scheme was included. So far as the House of Commons was concerned, that bill might have gone on. There was some technical defect, but the Standing Order Committee waived the objection. In the House of Lords, however, the Standing Order Committee did not do so, and the St. Mary's Loch scheme had to be struck out of the bill. The bill went on as a bill merely for a transfer of the undertaking. Some opposition was offered in the Commons committee, but terms were come to when they were fighting in the Lords, and ultimately it was passed by agreement. At the time these proceedings were going on, investigations were being made by engineers, and especially by Mr. Leslie, to see, on the part of the old water company, how the supply could be increased from some nearer and cheaper source. Mr. Leslie early fixed on the Moorfoot. In Edinburgh there had been a certain amount of wavering as to the proper source to go to, but Mr. Leslie, he believed, had never wavered from what he fixed in 1868, and indeed at a much earlier period. In 1869 the corporation, as Water Trustees, were in this position, that they had control of the old waterworks, with power to do all that could be done under the old Acts of Parliament obtained by the company, but without any power to get a new supply, at the same time that they were under an obligation to provide a constant supply in Edinburgh within a definite time. They found it impossible to do this from existing sources, and they were forced to go to Parliament for new powers. Accordingly, having come into possession in 1870, they went to Parliament in 1871, and the scheme they proposed was the St. Mary's Loch scheme. This scheme was undoubtedly very expensive, and necessarily so because of the distance of the loch from Edinburgh. The estimated cost was over £500,000. Either that or something else, or both together, raised a great opposition in Edinburgh. It could not be denied that the scheme would be very expensive. The bill passed the House of Commons. In the Lords they fared differently. There the opposition succeeded in convincing the committee that by economizing the supply in the Pentlands it was possible to get all the water that was required. The committee did the unusual thing of passing a resolution, in which it gave its reasons for rejecting the bill. These reasons were the great expense and the possibility (as they thought) of economizing the existing supply. Some of those who opposed that bill were here now opposing this bill; but he did not think there was one present who would maintain that that decision of the Lords committee was a right one. Even the ratepayers who petitioned against the present bill would not do so. Those ratepayers were here to object to the clauses by which the trustees made provision for paying their costs. Let it be remembered what he had said. The trustees, in 1869, were under an obligation to give a constant supply. They found they could not do so from the existing sources, and they went to Parliament for power to acquire new sources. No one now said they were wrong in doing so. The House of Lords did not put the rejection of the bill on the wrongness of the St. Mary's Loch scheme, but on the expense, and on the want of necessity for getting a new supply at all. In the Act of 1869 there was a proviso that a penalty should attach to the trustees if they were not prepared to give a constant service within a period of five years. Unless they were released from that, the trustees, at the expiry of that period, would be under a penalty for not doing what was now admitted by every person to be impossible. Now, as to the question of costs. The ratepayers who convinced the House of Lords that, by economy of the Pentlands supply, the trustees could do all that was required, came here now saying they had been wrong, but still objecting to the trustees getting their costs. Certainly, one would think that when people were required to do anything, they were justified in coming to Parliament to get the means to carry out their obligation. When the trustees were bound to give a constant service, they were surely, if not legally, at least morally, justified in coming to Parliament for the means. No sooner, however, was the bill thrown out by the Lords Committee, than proceedings were taken in the Scotch courts to make the trustees personally liable for the costs, and the unhappy gentlemen who had promoted the bill, and who had carried it through the House of Commons successfully, had actually been forced by a decision, though not a unanimous decision, of the judges to pay the expenses out of their own pockets. Was that decent? He was astonished that there should be some two or three thousand people who were not ashamed to come here and ask that gentlemen who had acted in that public way should not be relieved from the payment of their costs. Of course, there were always a number of agitators without consciences, or decency, or anything else, but he was astonished they had got so many adherents. If the promoters had been a company whose desire was gain, the case would have been different; but the promoters here were gentlemen, who were acting solely in the public interest, and who could not possibly gain anything by the passage of the bill. And yet there were people who said their expenses should not be paid. These ratepayers said they had to pay their own costs. Of course they had, and very properly, since they now confessed their opposition was wrong. The costs for which the trustees were made liable amounted, he believed, to as much as £19,000. The Edinburgh people were not without precedents for what they were doing. The same thing had been done in Glasgow. Two unsuccessful attempts were made to get the Loch Katrine scheme passed, and when the bill was actually passed, which it did in 1855, it contained a clause providing for the payment of past expenses. Another precedent was the Glasgow Bridges Act of 1866. It was necessary to state that at the time of these proceedings of the Edinburgh Water Trustees, the Act popularly known as Leeman's Act had not been passed. In fact it was partly in consequence of this case, that Mr. Leeman brought in his bill. But it was passed in a modified form. As originally introduced, it was intended to cover the case of Edinburgh and another case—that of Sheffield. In the latter case the corporation had brought in a bill to enable them compulsorily to buy the water and gas companies. It was not a *bonâ fide* case of their coming to get powers to comply with a parliamentary requisition. Accordingly, when the Sheffield Corporation came before Parliament again with a clause to indemnify them the costs, he (Mr. Denison), as counsel for the opponents, objected, and got it rejected. That having been rejected, they could not pick and choose among other corporations, and so all retrospective action was struck out of Mr. Leeman's bill, and places like Edinburgh were left to make separate application for indemnification. The Glasgow cases were two precedents in their favour, and he disposed of the only precedent against them. He had now to return to the history of the water movement. After 1871 of course the trustees set to work to see what they could do with their existing works and within their existing district. Of course they could only do so by taking the counsel of competent persons. They consulted Mr. Hawksley, who had been the engineer against them throughout the inquiry, and by doing so they showed their impartiality; and they also consulted their own engineer, Mr. Leslie. Both joint and separate reports were furnished by these gentlemen, and they concurred in representing that it was absolutely necessary to go to a new district. The consequence was that the trustees decided on proceeding with the present scheme, which included the taking of a supply from the Moorfoot and the making of some additional works at the Pentlands, the cost of which was estimated at £230,000, or less than £1 per head of the population. His friend, Mr. Venables, appeared for some people called the Mid-Lothian Water Company, and for Mr. Wardlaw Ramsay, who happened to be the chairman of that company. In 1872 an Act was passed by which that company was incorporated. He had been their counsel, and but for an accident would have been so still, and for the Mid-Lothian Company he told this story: Water was wanted in various districts of the county. A body of gentlemen had joined together to supply it. They took power to supply the whole county, but in regard to Edinburgh, Leith, and Portobello they only asked voluntary powers to do so by agreement. There was some opposition from the people of Edinburgh, and he asked what they were doing there opposing the bill when its provisions, so far as regarded them, were purely voluntary, and left them entirely at liberty to go to the Moorfoot or where they chose. A very good case was made out, and the bill passed. The strange thing now was that the Mid-Lothian Company, having carried their bill solely on the ground that it was voluntary and did not interfere with Edinburgh, turned round now and said to Edinburgh, "You must not go to the Moorfoot; we can supply you from the Manor." That, however, was not the position the referees had allowed them to take. They said all the company could appear against was a proposition to interfere with some small parts of Mid-Lothian districts, and the promoters introduced a clause prohibiting them from interfering with the district of the Mid-Lothian Company so long as they were able and willing to supply the district itself. The people of Edinburgh had acted with proper precaution in putting in the latter proviso, because last year it was doubtful if the Mid-Lothian Company would get on their legs at all. That should surely meet the case of the company. In order to ascertain the opinion of the public in reference to this scheme, the promoters had sent out voting papers, the result being that 2441 voted "general approval," 4553 "specific approval" of the Moorfoot scheme, and only 133 in favour of the Mid-Lothian Company. It was therefore quite evident that that company did not come forward in the interest of the public, but solely with the object of making a little more money. Besides, there were as many as 4986 who still stuck out for the expensive St. Mary's Loch scheme, and they must certainly be in favour of the trustees being indemnified. There wer thus about 12,000 on their side, and 133 against them. But how many of the *bonâ fide* ratepayers objected to the costs clauses? Why, only 79. In Portobello there was a majority of two to one in their favour. Leith was in this peculiar position, that it wished a Government inquiry, but as a Government inquiry could only result in approval of what they were doing now, the people of Leith were also to be reckoned on the side of the promoters. As to the objection by Mr. Ramsay that the promoters would not be able to supply the necessary compensation to the mills, the fact was that this was one of the very things the new reservoirs would enable them to do. Another provision in the bill was for altering the mode of electing trustees. Under the present system all the trustees retired every year. This was found to cause inconvenience, and interfere with continuity of action. They proposed to substitute the more usual plan of turning out a third every year. As to the opposition of Mr. Gilmour, his case was that the new pipe track would go through his property. So did the present one, and it must be left to him to show how he would suffer. The real fighting petition was that of the Mid-Lothian Water Company and Mr. Ramsay, their chairman. They were such patriotic people that they knew every person's business better than they did themselves, and objected not only to the quantity but to the quality of the water which other people and not they were to drink.

Mr. *James Cowan*, M.P., examined by Mr. CLERK.

I am member for the city of Edinburgh. Until lately I was a member of the Town Council and Lord Provost. I was elected a councillor in November, 1871, and Lord Provost in November, 1872. When I was Lord Provost I was *ex officio* chairman of the Water Trust. When I was elected Lord Provost I stated that my principal object would be to get a good supply of water for the city, and so bring about a settlement of the dispute on the subject. It had been going on two or three years, and had become very acrimonious. Before I became Lord Provost a special remit was made to Mr. Hawksley and to Mr. Leslie to report on the water supply of the Pentlands. The reports of these gentlemen were considered by the trustees. We had a superintendent of works, who sent us monthly reports as to the state of the supply in Edinburgh, Portobello, and Leith. For a long time there had been allegations in the papers as to the water being wasted in Edinburgh. I was not present at the inquiry before Parliament in 1871. I know that in the end of 1871 inspectors were employed for the purpose of checking waste. That was done in consequence of the decision of the Lords Committee. Four inspectors made a house-to-house inspection, and we found a great diminution of waste, which caused us to increase the number of inspectors to eight. We also appointed a competent person to examine and stamp all the taps, and laid down 10 miles of new pipes. The supply of water in 1873 was 880 cubic feet per man. The population

is 265,000, and the supply is equal to about 30 gallons per head. Last year was not particularly dry, and so did not try us very much. There are still a great many complaints about certain districts being inadequately supplied. These come principally from the poorer and middle classes. There are large tenements of houses being built in different parts of the city, and these are supplied with water and water-closets. The rental of Edinburgh has greatly increased—I believe to the extent of £30,000 or £40,000—by the erection in recent years of houses of a higher class which are supplied with baths and hot-water pipes. We made an effort to ascertain what the consumption of water among the different classes of the population was. Amongst the working people we were sorry to find that the consumption was less than 10 gallons a day, while in these new houses to which I have referred it was as much in many cases as 70 or 80 gallons per head for each occupant. A fair quantity of water is used for watering the streets, and we have a great many drinking wells to supply. Besides, at the present time there are 17,000 houses which have no water-closets or water-fittings at all. The occupants of these have to go to the public wells for their water. There is every desire on the part of the authorities to supply these houses with water, if there was any water to supply them with. The total number of houses in the Edinburgh water district is 56,151. The rate of the rateable value of property to the population is much greater in Edinburgh than in any other part of Scotland. This is owing to the large number of the higher class of houses. I have a table here which gives the ratio. I find from it that in Edinburgh the rateable value is £6 15s. per head of the population, while in Glasgow it is £4 18s.; in Dundee, £4 2s.; and in Aberdeen, £3 10s. The rateable value of Edinburgh is very much greater than all the large towns of England, except London and Liverpool. The reports on the Pentlands district, which were prepared by Mr. Hawksley and Mr. Leslie, were carefully considered by the trustees in April, 1873. These were prepared in accordance with the recommendation of the Lords Committee in 1871. Besides these reports, Mr. Leslie had made a separate report in 1871 with reference to the capabilities of the Pentlands. Mr. Hawksley was asked to report on the quantity of water we could still get from the Pentlands. The report was unfavourable in regard to cost and quantity, and we decided to abandon that source. The capabilities of the Pentlands, of the Moorfoot, and of the Lyne districts were all considered by the trust in April, 1873, and a formal vote was come to. Mr. Leslie was asked in addition to report on the Lyne, and we found on examination that although the quantity was sufficient, the water was tainted with a decided colour. In April, 1873, there was a vote in the trust in regard to the steps to be taken to enable the ratepayers to come to a resolution. A great deal of discussion took place in regard to the payment of the expenses incurred by the trustees in 1871. In the Act of 1869 the trustees had the water-works clauses incorporated, which compelled them to give a constant supply to everybody in the district; but a proviso had been inserted that they should not be bound to do that for a period of five years. After the rejection of the St. Mary's Loch scheme, an interdict was raised in the name of Mr. Charles Cowan and Mr. Colin Mackenzie, to prevent the payment of the costs of the proceedings in Parliament. The result was that the Court of Session decided that the trust had no right to pay those costs out of the rates. The question was discussed in Edinburgh, Leith, and Portobello last year, whether the corporations should go to Parliament for the power to relieve the trustees of the liability to pay the costs. The subject was repeatedly discussed in the Edinburgh Town Council and the Water Trust, and an application was made by the former body to the Corporations of Leith and Portobello, asking them to join in such a measure. The present scheme for bringing water from the South Esk was that which had been reported on by Mr. Hawksley. It was in consequence of our finding we could not bring water from the Pentlands that we asked Mr. Leslie to report as to the best source of supply, and he recommended the South Esk. Before this bill was introduced into Parliament, the opinion of the electors was taken by submitting a statement to them. It was originally intended to consult the ratepayers, but ultimately we decided to consult the electors. There were 24,000 of them, and we had very little time for the process. These electors are the persons who elect the city corporation, and the Water Trust is elected by the Corporations of Edinburgh, Leith, and Portobello. The corporation had been asked by the Water Trust beforehand to promote a bill in Parliament, because the trust, after the decision of the Court of Session, could not take the responsibility again. The corporation has a fund of its own, which is called the "common good," and which can be applied to purposes which they believe to be for the public benefit. The statement issued to the electors set forth the cost of the various waters in the neighbourhood of Edinburgh which we had had examined. The statement embraced the cost of bringing in each water, and the price it would bear in Edinburgh per 1000 gallons. The total number of voting-papers sent out was 24,832. Of the number returned 741 were invalid from irregularity in filling up, 441 were returned through the Dead Letter Office, and 124 were received too late. Of the votes given there were—Approving of the Town Council's proceedings, 5250; of which there voted for a specific scheme, 2809; gave no vote for a specific scheme, 2441; for the Moorfoot source there were 4553 votes; for the Heriot, 81; for the Lyne, 28; for the Manor, 133; for the Talla, 151; for St. Mary's Loch, 4986. After this vote the corporation decided to proceed with the scheme recommended by Mr. Hawksley and Mr. Leslie. I have personally examined the whole of the Moorfoot district, and, as far as I can judge, there is an excellent supply to be obtained there. I am satisfied it is quite as good as the water we are getting from the Pentlands. The bill also embraces a storeage reservoir in the Glencorse Valley, which runs in between the two ranges of the Pentland Hills. We found that in dry summers the existing reservoirs in the Pentlands went dry, and it was considered necessary to construct another reservoir to keep the pips always full. The whole body of the Water Trust at present go out in November of each year. I think this is very inconvenient. Only a third of the Town Council goes out every year, and as the election takes place about the time when parliamentary notices have to be given, it is desirable that only a third of the trust should go out. No one objects to that, I think.

Cross-examined by Mr. SOMERSET: I was not one of the trustees who appeared in the House of Lords to oppose the Mid-Lothian Bill. I am aware of the nature of the 52nd section.

Mr. CLERK objected that the Mid-Lothian Company were by the decision of the referees confined in their opposition to the 24th and 25th sections of the present bill. The 24th section enacted that the limits of compulsory supply should remain as they were, but that the limits of the Act should be extended for other purposes so as to include Inveresk, Liberton, Colinton, Corstorphine, and Cramond, all which places, or some of them, were within the permissive limits of the company.

Mr. SOMERSET: I meant the compulsory limits.

Mr. CLERK said there were no compulsory limits. The Mid-Lothian Act of last year was permissive from the first line of it to the last. It was an Act to enable a certain body to take water from the Manor and sell it to any one of the places mentioned in the Act, and there were no compulsory limits whatever. The decision of the Court of Referees was that the company's opposition must be confined to the 24th section, which was the one extending the trustees limits of permissive supply, and the 29th section, which had relation to it, and enabled the trust to enter into agreements with the places in question, together with so much of the preamble as was affected by these clauses. Therefore, to go now into any inquiry as to what took place between the Water Trust and the Mid-Lothian Company in regard to the supply of water, which was part of the trustees compulsory area, was perfectly irrelevant, and had nothing to do with the 24th section, to which the opposition was confined.

After some further discussion on the point, the CHAIRMAN said the committee were of opinion they could not interfere with the line of cross-examination adopted.

Cross-examination continued: Under the 52nd section of the Mid-Lothian Act, there is power for that company to supply water, if requested, to the Edinburgh Trustees. [Witness was cross-examined at great length as to the proceedings of the Edinburgh Corporation in relation to the present scheme.] In June, 1873, the council decided to make an investigation in regard to the Lyne. Mr. D. Stevenson and Mr. King visited the Manor and the Lyne, and made arrangements to carry out the instructions of the committee. Their report on the quality was very unfavourable, so much so that we decided upon giving up that source. They reported favourably of the Manor, and we were perfectly satisfied as to the quality of that water; but there were engineering reasons which made it utterly out of the question to adopt that scheme for Edinburgh. We then asked Mr. Leslie, as the engineer of the trust, to report, and in his report we placed implicit confidence. I have read Dr. Frankland's report on the Moorfoot water, and I agree with him in some respects, but not in the conclusions he draws. I happen to know that all the reports having the analysis of the Moorfoot water show it to be free from any organic impurity. It is subject, like other waters in time of flood, to be discoloured, and on the day on which Dr. Frankland's sample was taken and the day before there had been at Glencorse reservoir a rainfall of one-half to three-quarters of an inch. On the 10th of October the Town Council, by a majority of 19 to 10, resolved to recommend a *plébiscite*. My impression is that the council approved of the scheme, but declined to adopt it until they had a *plébiscite* to see whether the citizens approved of it. About that time I had various meetings with the provosts of Leith and Portobello in reference to our intention, but whether before or after that I cannot say. I am not aware that at the time of the *plébiscite* ward meetings were held in Edinburgh, at which this scheme was disapproved. Owing to arrangements with landowners the plan has been somewhat modified, but remains substantially the same. The present quantity of water to be brought in will not be so large as the original estimate, but the withdrawal of a million and a half of gallons per day will only be temporary, and it will increase the price about one-sixth in the meantime.

By Serjeant SARGOOD: In 1870 I was one of the body who opposed the St. Mary's Loch scheme. In the petition to the Houses of Lords and Commons, to which I was a party, other sources of supply were pointed out as open to the trust without going to so great a distance. Among others, the petition mentioned that the Moorfoot district was open. I do not think it inconsistent to be advocating a scheme to take water from the Moorfoot, having pointed it out as a proper source. I think the opponents of the 1871 scheme would be generally in favour of the Moorfoot. I know that at that time great complaints were made as to the withholding of information as to the cost of the scheme. Mr. Leslie made the cost of the St. Mary's Loch scheme very considerably more than the £500,000 at which it was estimated; but Mr. Leslie's report which made that disclosure never came before the public till its production was insisted on in the parliamentary inquiry of 1871. When the election of trustees in 1870 came round, a large section of the community felt that it was inexpedient that all the trustees should belong to the corporation. After the new trust was elected there was still a want of information for the people. On the 16th of February, 1871, there was a ratepayers meeting, at which the bill promoted was condemned, together with the conduct of the trustees, and it was agreed to call upon them to withdraw the bill. The meeting agreed to petition against the bill unless the trustees should withdraw it, and that petition was lodged. At that time the expense incurred by the trustees would have been very much less than it afterwards became. There was a petition against the bill signed by 14,000 people, and the number amounted to 15,000 when the opposition had to be continued in the House of Lords. There was in Edinburgh very strong public excitement on the question, which was made a test in the election of town councillors, and out of 13 wards men were returned who stood as 10 to 3. The next Water Trust was filled with new trustees, and all avowed opponents of the St. Mary's Loch scheme.

TUESDAY, MAY 19.

Mr. *Cowan* was recalled and further cross-examined by Serjeant SARGOOD as to the history of his opposition to the water bills up to the time of his becoming Lord Provost in 1872. He was also examined as to rating clauses in the present bill, and the proposition to pay out of the rates the costs of the previous bills.

Serjeant SARGOOD: In regard to the *plébiscite* about the present bill, in taking the opinion of the ratepayers as to the source of supply, you gave them an opportunity of saying what they thought about the payment of costs. The result, I think, was that out of 24,832, there were 2554 in favour of the payment of the expenses. Did the Water Trust think that was a fair representation of 24,832?

Witness: Yes, they did; for whilst 24,000 schedules were issued, only 13,000 answers were received. Then we had a general vote in favour of the proceedings of the council of 5250.

Serjeant SARGOOD: You think the general approval of the scheme included a practical sanction of the payment of the £19,000?

Witness: I came to that conclusion.

Re-examined by Mr. CLERK: The real opposition to the present scheme consisted of 5960 who were in favour of the St. Mary's Loch scheme, and who may be supposed to be in favour of paying the expenses of the last bill. It was absolutely necessary in 1871 to introduce a bill for the purpose of getting an additional supply from some source. If there had been a dry summer the damage would have been very great. The St. Mary's Loch scheme was prominently before the ratepayers in 1869, and at the elections in 1870. I do not know that there was then any great opposition, or until a month or two after the elections. When the bill came before Parliament, Mr. Stewart, Mr. Bateman, and Sir John Hawkshaw were here to support it. I have now no doubt of the *bona fides* of the trustees. I think they were wrong in going on against the wishes of the ratepayers, but I have no doubt they acted in good faith. The present scheme was prepared by the Lord Provost's committee, and the *plébiscite* was taken by the Coporation of Edinburgh. Although I took a prominent part in the opposition to the bill, I proposed the insertion of the clause providing for the payment of the costs. I have no interest in the matter whether the water is brought from the Manor or the Moorfoot.

Lord Provost *Falshaw*, examined by Mr. DENISON.

I have for a long time taken considerable interest in this water question. There has been a great want of a proper water supply in Edinburgh for some years. In 1870 we got as low as 15 or 13 gallons per head for some weeks, and if a dry summer were to happen we would have a considerable deficiency. I concurred with the Town Council in promoting this bill. For many years I have thought this scheme was the proper one. I know it was a scheme of the old company, and they were well acquainted with the places for obtaining the best supplies at the cheapest price. From my engineering knowledge, besides, I can say the source is favourably situated. I neither promoted nor opposed the St. Mary's Loch scheme. I thought at the time it was going a long way for water, and paying a very heavy rate for it. If the cost was proportionate to that of the Glasgow works, I estimated that it would amount to £750,000. In one respect, I think, the trustees acted *bonâ fide* in promoting that scheme. I believe they were honestly inclined, but I do not think they should have applied for the scheme with so small a majority. At one time I had doubts as to whether they should be indemnified, but I have modified my opinion, more

especially since the *plébiscite*, which showed that there was no great objection on the part of the ratepayers to the costs being paid.

Mr. DENISON: Is there a belief that this Mid-Lothian Company has no reality?

Witness: I have never seen anything of it. There is a belief that there will never be any subscription of capital, and I know they have not done anything yet to carry out the Act. They are not the kind of people I would like to trust to for water. As to the possibility of their supplying the water, I thought it better not to go into the question myself, and so I left it to Mr. Leslie. In consequence of Mr. Leslie's report, we came to the conclusion that the Manor scheme was not sufficient to supply Edinburgh with water.

Cross-examined by Mr. WILL: The Mid-Lothian Company represented last year that they had a supply of five million gallons, of which one million was required by themselves, and the remaining four could be devoted to Edinburgh; but I never believed it. We have done a great deal at Edinburgh to prevent waste. If the present supply of water were guaranteed, we would have no great fault to find; but it is liable to fail us; and, besides, there is a large increase in the better class of houses and manufactories, which causes the demand for water to increase also.

Mr. WILL proposed a question as to Mr. Leslie's report, which led to some conversation on an objection raised by Mr. Clerk, and the committee decided that the learned counsel was not justified in going into that question.

Cross-examination continued: I know the watershed of the proposed source. It is not more than ordinarily peaty. I do not know the quantity of peat there is, but I believe it will be submitted. I have seen the water of the district in flood, and even then it had a very good appearance. My objection to taking water from the Mid-Lothian Company rests not on the quality, but on the quantity. Apart from the cost altogether, we think we can get ourselves a large supply at a less rate. Besides, only in 1869, one vested interest was broken up at a heavy cost, and I do not think we should establish another. I do not think I was ever of a contrary opinion. I do not think I was ever in favour of taking water from the Manor.

Mr. WILL: Assuming that you could get four million gallons of water a day from the Mid-Lothian Company, would not that give you 16 gallons per head per day of an additional water supply for Edinburgh?

Witness: I am not going to assume that which I do not believe.

The CHAIRMAN: But assume for the moment that you could get this four million gallons a day, would that give you an additional supply of 16 gallons per head per day?

Witness: I say this is a matter of calculation entirely; probably it might.

Mr. WILL: What is your objection to letting in another vested interest?

Witness: What I am afraid of is this. I think we ought not to have any other company or trust set up against our own. We have spent a great deal of money to get possession of the old water-works, and, having done so, we want to be repaid.

Mr. WILL: What the Mid-Lothian Company were to do was to hand you the water in bulk for you to use, to distribute, so that you could still be the only vested authority in your district.

Witness: Yes; but we should not have command of the source of water, or of the reservoirs and works.

Mr. WILL: But they would be under penalties to supply.

Witness: If there were no water the penalties would not go for much. They would not satisfy the thirst of the people.

Mr. WILL: The Mid-Lothian Company told you that you could have four million gallons a day at the rate of 2½d. per 1000 gallons?

Witness: I believe they did.

Mr. WILL: The Act of Parliament limits our supply to five million gallons a day, and the evidence which we adduced in favour of liberty to supply Edinburgh with water went to satisfy the committee that we only required for county purposes one million gallons, and that the residue of water would be available for the supply of Edinburgh.

Mr. CLERK: I beg your pardon; it was nothing of the kind. I took an active part in the discussion of these things last year, and I am entirely at issue upon the state of facts which my learned friend has stated, and I would ask the committee to reserve their opinion upon them until they have them on sworn evidence.

Cross-examination continued: I do not think the Mid-Lothian proposition would have been a cheaper mode of supply than the present scheme. I calculate this will cost us about 1¼d. per 1000 gallons delivered at the reservoir.

Mr. WILL proceeded to ask questions respecting the compensation water to the millowners, but

Mr. CLERK objected, on the ground that Mr. Ramsay, for whom the learned counsel appeared, was not a proprietor on the South Esk.

Mr. SOMERSET said what his learned friend desired to elicit by his questions was what Mr. Dundas wanted with 135,000 gallons of water a day. He contended that what this large supply was wanted for was that he might supply the villages in his district which the Mid-Lothian Company had power to supply under the bill of last year. He appealed to the committee whether they were not to be allowed to go into this matter, when the effect might be to deprive them of half the district which they had had power to supply with water. He asserted advisedly that the object of the bill was to destroy the Mid-Lothian Act of 1873.

Mr. CLERK reminded the committee that clause 13 B did not give them any other area of supply than was specified in the bill as originally deposited, and the 24th clause provided that they could not supply certain districts without the consent of the Mid-Lothian Company.

The CHAIRMAN: The question is whether they are going to give to those parties something that they have not got already.

Mr. SOMERSET: That is part of the question, and a very important part, but we must carry it further. We say distinctly that they are going to give them something which they have not got already, and that they are going to do this to our detriment. I pledge myself to call evidence, with a view to substantiate this.

The CHAIRMAN: In that case we cannot stop you putting these questions.

Cross-examination resumed: One portion of the 490,000 gallons per day is to be given to Mr. Dundas, and another portion to Lord Dalhousie. These proprietors at present have all the flow of their own water. They have the running stream, which we propose to impound down to the burn, and surely we cannot in fairness do this without giving them something in return. It may be that some of these districts are within the limits of supply of the Mid-Lothian Water Company, or that the quantity of water to be supplied would be equal to 25 gallons per day of the population of these districts. I am aware that the clause contemplates that the water is to be supplied through supply-pipes. A supply for domestic use is, I believe, contemplated.

Re-examined by Mr. CLERK: The Mid-Lothian Water Company take their water from the Manor district, and draw none of their supply from the South Esk. We propose to abstract almost the whole of the water of the South Esk stream, and of course we have had to come to an arrangement with the proprietors who have hitherto been entitled to the whole flow of the stream, for giving them compensation. For instance, Mr. Craig, the proprietor of paper mills at Newbattle, would have been already entitled to receive from the Musselburgh and Dalkeith Company, had they proceeded with their works, the same quantity of water in compensation as we propose to give him in this plan. There is no provision by which the Mid-Lothian Company, so far as I can see, could give compensation water to South Esk. It is provided in this bill that the compensation water is to be given when the proprietors have laid down a pipe through their different estates for the purpose of receiving it. There is no obligation on the part of the Edinburgh District Water Trust to take water from the Mid-Lothian Company; and having fully considered the subject, I see no reason why we should be compelled to exercise the discretion which was last year vested in us of taking water from them. In the first place, it would be more costly than getting the water from the Moorfoot Hills, and in the second, we would have to buy such water in bulk as this company could command.

Mr. CLERK: But suppose in dry weather there was no more water to be got out of the Manor district than 3 million gallons altogether, would that leave a sufficient quantity to supply Edinburgh after giving a supply to the populous villages in the Mid-Lothian?

Witness: I do not think it would. The Water Trust and the Corporation of Edinburgh considered this matter very seriously before deciding upon embarking upon another contest in Parliament.

Hon. *J. W. Moncreiff*, examined by Mr. CLERK.

I am a writer to the signet in Edinburgh, and clerk to the Edinburgh District Water Trust. On the 15th of March, 1872, the Water Trustees instructed Mr. Hawksley, civil engineer, and Mr. James Leslie to report on the unexhausted resources of the Glencorse Valley, and also to report generally on what was called the Moorfoot scheme, with a view to the initiating of legislation regarding the water supply in the session of Parliament of 1873. These gentlemen made their report on the 16th of September, and it was considered at a meeting of the trust on the 10th of October, 1872. A resolution was then passed approving generally of the Moorfoot and Pentland schemes. No steps, however, were taken in Parliament during the last session by the trust. The recent effect of the interdict was hanging over them. On the 18th of April last year, the report of Messrs. Hawksley and Leslie was again considered by the trust, and on the motion of the Lord Provost, a resolution was carried, by a majority of 13 to 4, to the effect that with reference to future legislation the trust recommended that action should be immediately taken to enable the ratepayers to come to some definite resolution as to the future water supply, by preparing a bill to enable the trust to bring in the water of the Glencorse Valley, especially referred to by Mr. Hawksley and Mr. Leslie in their report. The resolution was communicated by me to the Town Councils of Edinburgh, Leith, and Portobello. The parliamentary notices for the present bill were submitted to the trust on the 24th of November. A division then took place, and the numbers were 16 to 8. The resolution which was then carried was to the effect that the trust approved generally of the parliamentary notices given on behalf of the bill for an additional supply of water. The bill itself was submitted to a meeting of the trust on the 8th of January, 1874, when a motion to proceed with it was adopted.

Cross-examined by Mr. WILL: The report of Mr. Hawksley and Mr. Leslie had been made in sufficient time to have come for a bill in 1873, had it been determined so to do. At the same time, the Mid-Lothian Company stepped in and proposed their scheme. That scheme was opposed by the Edinburgh Water Trust, but was ultimately sanctioned notwithstanding their opposition.

Mr. *Alexander Harris*, examined by Mr. POPE.

I am deputy city-clerk of Edinburgh. In that capacity I came in possession of a report made by Mr. Benjamin Hill Blythe for the Town Council. That report was dated the 15th of April 1863, and was in favour of this Moorfoot scheme as a source of supply. Samples of that water were submitted to Professor Playfair, who reported generally in terms of commendation of the water. The report made by Mr. Leslie is the foundation of the present bill. On the 18th of October, the Lord Provost preared a statement to be issued to the ratepayers of Edinburgh with a view of ascertaining their opinions on the subject of the proposed water supply. The statement was issued by my instructions by means of post-cards to the whole of the registered electors of the city. The result of the voting, so far as they thought worth while to express an opinion, was that 2441 voted confidence in the Town Council, without mentioning any specific source of supply, and 4553 voted in favour of the Moorfoot especially. The witness gave formal evidence in detail as to the various resolutions which had been passed from time to time by the trust, and also by the Town Council, in relation to this matter.

(To be continued.)

Legal Intelligence.

NORTHAMPTON PETTY SESSIONS.—SATURDAY, MAY 16.

(*Before Mr.* H. O. NETHERCOTE, *Chairman, and Mr.* R. L. BESAN.)

ILLEGAL APPROPRIATION OF WATER.

James Barker was summoned by the Northampton Water-Works Company for that he, being the owner and occupier of 143, Wellingborough Road, did unlawfully and wilfully permit certain other persons, to wit, Mary Billingham, wife of Thomas Billingham, 141, Wellingborough Road, to take water from the tap of the said house and premises—the said Mary and Thomas Billingham not being persons supplied by the said company—on May 1.

Mr. GREEN appeared on behalf of the company, and Mr. SHOOSMITH for defendant. It was decided to take the case in which the defendant was summoned for permitting Wright to draw water first.

Mr. GREEN said he appeared to prefer a complaint against Barker, for that he, being a person supplied with water by the water company, had illegally supplied other persons with that water. Unfortunately this was a case which had been, in reality, several times before the bench. Mr. Barker had formed an opinion upon the Act that, by taking water through a meter to his own premises, he could supply any number of persons occupying separate tenements. The company had always joined issue with Barker upon that, and three times the case had come before the magistrates. The bench had always held that Barker had no right to carry out his view of the law, and upon the last occasion when an appeal was made against the decision of the magistrates, the learned Recorder dismissed it, and ordered Barker to pay the costs. The facts were very simple. The company laid on the water to No. 143 (Mr. Barker's own house), but there had been a contention as to his right to take that water for 139 and 141. The company refused their permission, but at last, by arrangement with his attorney, who admitted Barker had no right to supply others, they laid it on for 143. After the last decision of the bench, and pending the appeal, Mr. Barker laid on a pipe to the pipe supplied by the company, and brought it into connexion with an old tap in the yards of 139 and 141, thus supplying his tenants in the very teeth of the decision of the magistrates. Upon the occasion of the appeal, Mr. Merewether, the counsel for the company, argued that they were not compelled to supply the appellant with water for the premises of 143 if it were satisfactorily proved that he intended to violate the conditions. The Recorder was then satisfied that such was the intention of the appellant, and dismissed the appeal. It appeared to him that this case was practically undefended, and, as a reason for this, he quoted the words of Mr. Graham, who, upon the occasion of the appeal, relied on the notice given by the defendant, which was solely an application for a supply of water for No. 143; if he violated the company's Act by supplying water to other persons, he would assuredly be answerable for such violation.

The clause which gave any inhabitant a right to a supply of water from the Northampton Water-Works Company was 47 of the special Act. That clause enacted that the company should, at the request of the owner or occupier of any dwelling-house, lay down a communication-pipe from the service-pipe to the premises of such owner or occupier, and furnish to each a supply of water for domestic purposes. That, it would be observed, applied to one house only. The

59rd section then went on to say that every person entitled to have a supply of water should be entitled, if he thought fit, to have such water supplied by meter. This simply meant that persons were entitled to have a supply for domestic purposes, and the privilege of having a meter was confined within the same limits. No additional rights whatever were given by it. Section 59 enacted that the company might, from time to time, supply any person with water for any purpose for which such supply might be required, for such remuneration and upon such terms and conditions as might be agreed upon between the company and the person desirous of having the water under a special agreement. That section was inserted for the reason that if Barker's contention were to hold—that by taking a meter he might use the water for any purpose—he might really supply persons beyond the limit of the Act, and water might be supplied which would be beyond the means of the company to supply. If the Act were examined, it would be seen that the whole purview of the statute only comprised a supply of water for domestic purposes to persons, unless by special agreement. Domestic purposes meant for the use of a man and his family, and it could not be held to extend to persons living next door, or along the whole street. He believed section 66 would be relied upon by his learned friend, as it enacted that it should not be lawful for any owner or occupier, without the consent of the company, to affix, or permit or suffer to be affixed, to any of the mains or other pipes of the company, or to any service-pipe of such owner or occupier other than and except a pipe supplied by means of or through a meter, any gutta percha or other tubes or pipes for the purpose of washing the windows or fronts of houses and other buildings, or the pavements or roads adjacent thereto, or for watering gardens, or for any other purposes whatever. To this was attached a penalty. The defendant had read that section backwards, because he contended that, being supplied with water through a meter, he had a right to apply it to any purpose he thought proper. In point of fact, having regard to the whole Act, the simple meaning of this section was that, inasmuch as it might be taken the term "domestic use" comprised the objects mentioned here, they would enact that the persons not having water supplied by meter would not be permitted to exercise those objects. It drew a distinction between persons having a meter and those who had not, and the former would be permitted to put a little wider construction upon the term "domestic use." The whole of the Act must be construed together, but if the argument of his learned friend were to prevail it would utterly put upon one side section 59, which required persons having water for any purpose to enter into a special agreement. By section 49 it would be seen that all amounts of rate were fixed according to the value of the house, and it had reference to one house and one occupation only. Section 64 also bore upon the question—"When several houses or parts of houses in the occupation of several persons shall be supplied by one common pipe, the several owners or occupiers of such houses or parts of houses shall be liable to the payment of the same rates for the supply of water as they would have been liable to if each of such several houses or parts of houses had been separately supplied with water from the works of the company by a distinct pipe." That section enabled the company to supply several houses by one pipe, but it was entirely at their own option. Section 58 of 10 Victoria, cap. 17, page 258, under which the summons had been issued, enacted that every owner or occupier of any tenement supplied with water under this or the special Act who supplied to any other person, or wilfully permitted him to take any such water, unless for the purpose of extinguishing fire, or unless he be a person supplied with water by the undertakers, and the pipes belonging to him be, without his default, out of repair, shall forfeit for every such offence a sum not exceeding £5. The only question for the bench to decide was as to the amount of penalty, and he should ask them on behalf of the company to interfere, and by the infliction of the maximum amount, tell Mr. Barker that this setting himself up against the decisions which had been previously given against him would be no longer countenanced. The company had now met Mr. Barker four times, the matter had been fully argued, and yet he persisted in harassing them with litigation. Not alone was it a matter of annoyance to the company, but it appeared to him that he was setting himself up against all law and authority, and under those circumstances it would be an unwise forbearance to let him off easily. He might have brought any number of charges, and have recovered penalties for each offence, but he had contented himself with two, which he would now call witnesses to prove.

Evidence in support of the complaint having been given,

Mr. SHOOSMITH addressed the bench for the defence. He said he would admit the evidence which had been given, and rest his arguments upon the question of law. There was no doubt the defendant was under the impression that where the water was supplied by meter he had a right to use it as he liked, and he would endeavour to show that he had that right. In the first place, section 47 authorized the owner or occupier to demand service of water for domestic purposes, upon certain conditions, which he would assume had been complied with; but clause 53 contained an additional enactment, to the effect that every person entitled to have a supply of water could, if he thought fit, have such water supplied by meter. This he considered an addition to the 47th clause, and section 66 entitled him to use it for any purpose whatever. That was his interpretation of the clause.

The CHAIRMAN asked Mr. Shoosmith if he contended that the defendant had a right to use the water for any purpose, and allow his tenants to use it.

Mr. SHOOSMITH replied that such was his contention; it went through the defendant's meter, and it mattered not who used it. None of the clauses which limited the use of water to domestic purposes applied to this case, as the defendant was supplied by meter. With regard to the 64th clause, read by his friend, he considered that it was really an argument in his favour, because it admitted and assumed that several houses might be supplied by the same pipe.

The CHAIRMAN: With the consent of the company.

Mr. SHOOSMITH replied that the Act did not say so. It stated that the owners or occupiers would be liable to the payment of rates, as though they were supplied separately, and it might be that in this case the company could have sued the defendant on the ground that he had incurred the liability to pay at the rate of 7s. 6d. per quarter, or whatever sum was charged by them for separate cottages. He denied, however, that defendant had incurred penalties. Clause 59 would not support the construction put upon it by Mr. Green, as it was simply a permissive clause, giving the company power to supply water for another purpose.

Mr. GREEN: Look at clause 52.

Mr. SHOOSMITH replied that that did not apply, because it was simply enacting a penalty for using water for other than domestic purposes without agreement. That was taking for granted the argument that the meter did not involve the supply of water for anything but domestic purposes. There was no special agreement. A man applied for water by meter, and he had a right to use it to any extent and for all purposes.

Mr. GREEN: Then the fact is he might supply the whole town.

Mr. SHOOSMITH said that was his contention. But there were practical difficulties in the way of that which would prevent his taking the control away from the water company, because they had powers for laying down pipes, and a private individual had not; consequently, the convenience must be limited to the owner who had several houses together. If he had to pass over another person's premises he would be stopped. Even if it were not so there was nothing in the Act of Parliament to limit it. He did not expect, after the arguments which the bench had been accustomed to hear, and after the great authorities quoted against him, with whom he would not put himself in competition, to be successful in his view of the case, but he could not help thinking it was a view which would ultimately prevail, and he believed that when it came to be argued in a superior court, it would at least meet with more consideration than it had in Northampton. It was Mr. Barker's intention, supposing this case was decided against him, to ask for a case in order that he might take it to a superior court. It was not without considerable authority and encouragement from gentlemen in the legal profession, whose status and position were very high, that Mr. Barker had been encouraged to do this. There were gentlemen of high position as barristers-at-law, who had given their opinion that his construction of the Act was a true one.

The magistrates then retired to consult. After a short absence they returned, and

The CHAIRMAN said that, having given their best consideration to the case, they were of opinion that Mr. Barker had committed an infringement of the Act. They were of opinion that the use of the water through a meter was restricted to the party who had contracted with the company. They, therefore, inflicted a fine of 40s. and costs.

Mr. SHOOSMITH applied under the 20 & 21 Vict., c. 23, for a case, and, after some conversation, the bench granted one.

WREXHAM BOROUGH PETTY SESSIONS.—MONDAY, MAY 18.

(Before the MAYOR *and a Bench of Magistrates.)*

FRAUDULENT CONSUMPTION OF GAS.

Henry Hughes, of Rhosddu, joiner, was summoned at the instance of the Wrexham Gas Company for having improperly used gas belonging to the company, after his service had been disconnected and the meter taken away.

Mr. THOMAS BURY appeared for the prosecution, and Mr. SHERRATT for the defendant.

Charles Fraser Munro said he was a clerk in the employ of the Wrexham Gas Company, and lived in Rhosddu. In going to and from business he passed and repassed the defendant's house. On Monday night, the 11th inst., about a quarter to ten, he was passing defendant's house on his road home, and he noticed a very bright light in the window on the Rhosddu side of the doorway. The blind was down. He went to the door, his suspicions being aroused, as the light could not have proceeded from a lamp or a candle. He knocked, and defendant's wife came to the door. When she opened it he could see into the kitchen. He saw that gas was burning there from a bat's-wing burner. He said, "Mrs. Hughes, you are burning gas without a meter." She shut the door in his face, and the light was instantly put out.

Cross-examined: Petroleum would not make so bright a light. On the following morning he saw a lamp hanging below the gas pendant. It was a paraffin lamp. It would not cause such a light as he saw the night before. He did not see defendant there. When he said, "Mrs. Hughes, you are burning gas," she replied, "No, we are not."

By the BENCH: I am certain the lamp was not attached to the pendant the night before.

Mr. *Thomas Walker*, secretary and manager to the gas company, said he knew the house of defendant in Rhosddu. He was supplied with gas by the company up to the 7th of May, 1873. The gas was then disconnected in consequence of non-payment of his gas bill. No application had ever been made to the company since to restore the supply of gas. In consequence of what the last witness told him he went to defendant's house last Tuesday morning. He examined the service-pipe of the company from the main in the street to where the meter had been fixed. He found the tap turned tight. That tap regulated the supply from the main before it enters the meter. Found the exit-pipe on the house side closed, and noticed that there was a lot of smoke on it as if from a candle. The pipe smelt strongly of gas, which would have gone from the meter to the house if a meter had been there. He examined the pendant, and found a lamp suspended to the bend by means of a white rag. It was an oil lamp.

Cross-examined: The long pipe produced he took from the main tap to the meter and the shorter piece from the outlet of the meter to the house. Candle smoke would not appear so fresh on the pipe after a lapse of a year.

Re-examined: Nothing would be easier than to connect these two pieces of pipe by a flexible tube. They smelt very strongly of gas.

Daniel Williams, gas-fitter, in the employ of the company, said he disconnected the gas and brought away the meter from the defendant's house last year. He cut off the inlet and outlet pipes, and squeezed the inlet up. The long pipe took the supply from the main into the meter, and the short pipe conveyed the gas into the house. The short pipe was not closed by him. He closed the pipe with pliers. There was a hollow place in the pliers that made a tooth-mark in the lead. Used no candle to the pipe in disconnecting the meter. Pliers would not produce such marks as were on the short piece of pipe.

Mr. SHERRATT then addressed the court for his client, and called Eliza Eaborn, wife of a coach painter, who said she resided next door to the defendant, and had done so for over twelve months. She called in there lately at night. Was not there last Monday. Had not seen any gas burning in the house.

By the COURT: The house was lighted by a paraffin lamp which was suspended to the gas pendant.

Joseph Hughes, son of defendant, who was at home on Sunday and Monday, said the kitchen was lighted with two lamps, and the larger one was tied to the pendant on Monday evening. Since the meter was taken away they had been using candles and lamps. The light given by the lamp was as good as gas. Had seen the burner on the gas, but would swear it had not been lighted for the last six months. He came home about ten o'clock, and found the lamp burning on the pipe.

By the BENCH: The lamp was tied to the pipe by a piece of string.

Mr. BURY declined to ask the witness any questions.

The BENCH, after deliberating for a short time, decided that the case had been proved, and inflicted the full penalty of £5 under the Act; in default, two months imprisonment.

Miscellaneous News.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary Meeting of Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, May 26—PHILIP TWELLS, Esq., M.P., in the chair.

The SECRETARY (Mr. Albert F. Jackson) read the notice convening the meeting.

The CHAIRMAN, in affixing the corporate seal to the register, stated that the present number of shareholders was 1794. In 1870, when the rearrangement of shares took place, the number was 1235.

The SECRETARY read the following report of the directors for the half year ending Dec. 31, 1873.

The present half-yearly ordinary meeting of the shareholders has been convened, agreeably to the company's Act of Parliament, for the purpose of receiving a report from the president and directors upon the affairs of the association, and for declaring a dividend for the half year ended the 31st December last.

Gas Made.—The total quantity of gas made at all the stations in the half year ended Dec. 31, 1873, was 2601 million cubic feet. The total quantity made in the corresponding half year of 1872 was 2589 million cubic feet, being an increase of 12, or at the rate of about one-half per cent. notwithstanding the sale of the Cologne works to the town.

Lights.—The total number of lights at all the stations on Dec. 31, 1873, was 1,011,919; the total number of lights on Dec. 31, 1872, was 1,017,458. These figures show a decrease of 5539, or rather more than half per cent. The total number of lights at Cologne at the end of 1872 was 90,744, which have been given up.

Mains.—The total length of mains laid up to Dec. 31, 1873, was about 1157 miles

being a decrease of only 3 miles on the corresponding half year of 1872, notwithstanding the 63 miles of mains ceded at Cologne.

The directors have to report that the works at all the stations were in an efficient condition, and equal to all requirements.

The general affairs and special business of the association were as hitherto conducted under the superintendence of Mr. G. W. Drory, ably seconded by the several engineers and other officers.

Secondary Products.—The value of the secondary products, coke, tar, and ammonia, was only 62·97 per cent. of the cost of the coal carbonized, being a decrease of 10·72 per cent. on the corresponding half of the year 1872.

The rental for the half year now under consideration was larger by £21,034 than for the corresponding half year of 1872, but nevertheless the profit was less by £50,700. This diminution is due principally to the proportionate additional cost of coal, which amounted to £90,164, to the diminished proportionate value of the secondary products, which was due in part to the unusual or exceptional mildness of the weather, rendering it impossible to sell coke at a price proportionate to the high cost of coal. The difference between the price realized for coke in the half year ended Dec. 31, 1873, and that realized in the corresponding half year of 1872, was £40,000.

The coal employed in the last half year cost about £80,714 more than the coal employed in the corresponding half of 1872, all of which is attributable to increase of price, the quantity of coal consumed being less in the second half year of 1873 than in the corresponding half of 1872.

Various additions to the apparatus and mains have been made at many of the stations. Among them may be mentioned, as the most important, the following.

At Vienna, additions have been made, at four of the five works, to the retort power and the purifying power, and also to the mains in the district generally, and to the public lighting apparatus, at a total cost of nearly £35,000.

Both at Brussels and Aix-la-Chapelle the new works have been proceeded with.

At Hanover the additions to the retort-house, purifiers, condensers, &c., have been considerable.

At Lille a new tank and gasholder, and additional purifiers have been found necessary.

At Antwerp additional land has been purchased and new purifiers erected.

Besides which additions have been made to the works and mains at Berlin, Bordeaux, Frankfort-on-Maine, and Ghent.

In the prices for the public and private lighting, with one exception, no change has taken place at the various stations since the last report.

At Ehrenfeld (the only works we now possess in the neighbourhood of Cologne) an announcement was made at the end of last year to the consumers, that a return would be made (by reason of the great cost of production) to the original contract price, as the price charged was totally unremunerative.

At Cologne the further claims of the association against the town and the town's counter claims have been sent in, and experts appointed to make the necessary valuations. A final settlement may now be reasonably expected.

With regard to Antwerp, it was stated in the last report that negotiations had been carried on with the municipal authorities for a new contract. Those negotiations were continued during the half year now under consideration.

At Vienna endeavours have been made to meet so far as possible (consistently with the enhanced cost of production of gas, and with the interests of the association) the views and wishes of the authorities, and so obtain a renewal of the contract for public lighting, on terms fair and equitable to all parties concerned. The directors are carefully continuing these endeavours.

At Haarlem also negotiations for a renewal of contract are still pending.

At Brussels the town invited tenders for their lighting, upon the terms of a "cahier des charges" drawn up by themselves, and fixed the 6th of last October for such tenders to be sent in. At the meeting of the "Collège" on that day no tenders were presented, but a letter was read from the association to the effect, that although we were unable to take part in the adjudication upon the terms of the town's proposed "cahier des charges," the association would always be pleased to negotiate upon other terms.

At Bordeaux, the town put up the lighting to public adjudication on the terms of their own "cahier des charges," but on the 24th of July last, the day fixed for receiving tenders, no parties presented themselves to tender. On the 23rd of August last, however, the mayor signed a contract with a French company, which contract on the same day received the approval of the Town Council. Fortunately such contract, which appeared to the president and directors to be inconsistent with the rights of the association required the ratification of the "Conseil d'Etat" at Versailles, to whom it was duly sent forward by the "Préfet." As was stated from the chair to the last meeting of the shareholders, Mr. Julian Goldsmid proceeded in September last to Bordeaux and Paris in the interests of the association, and after his return a memorial against the ratification of the above-mentioned contract was sent from London on the 6th of October last, to the Minister of the Interior of the French Republic at Paris. Mr. Goldsmid shortly afterwards again proceeded to Versailles. Mr. G. W. Drory also visited Paris early in December last. Finally, after a careful examination and consideration of the said contract, and of our memorial against it, and numerous documents in connexion with them, collected and supplied by our engineer and agent at Bordeaux, Mr. da Costa, and Mr. Bouscasse, the "Conseil d'Etat," on the 27th of December last, refused to ratify the said contract.

To Mr. Julian Goldsmid, for his personal services, at once energetic and judicious, the directors consider the association is much indebted.

The directors are continuing their efforts to obtain the renewal of the Bordeaux contract.

The president and directors would now beg to draw the attention of the shareholders to the accounts for the half year ended the 31st of December last. From these accounts, which have been duly audited, the directors have, in accordance with the provisions of the Companies Clauses Consolidation Act, prepared a scheme, showing the profits of the association for the past half year, and the portion thereof applicable to the purposes of dividend, which the president and directors recommend now to be declared—namely, a dividend of £1 15s. per share payable free of income-tax, on and after the 15th of June next.

The directors who go out of office by rotation are Sir Francis Henry Goldsmid, Bart., M.P., John Carrington Palmer, Esq., and Thomas Henry Goodwin Newton, Esq. The auditor who goes out is Thomas Newton Stokes, Esq. These gentlemen are all eligible for re-election, and offer themselves accordingly.

The CHAIRMAN: Gentlemen, I am afraid it has not been usual, during the present year, for any directors of gas companies to be able to offer to their shareholders a report of unqualified congratulation, and such, I must confess, is our own position on this occasion. With regard to the efficiency of our works, the extent of mains, and the number of lights, our affairs, as you have heard from the report, are as satisfactory as they can possibly be. The only causes we have for complaint are those which have arisen from the unusual and unsatisfactory cost of coal. But, unfortunately, our object is not merely to make gas, but profit, and it is clear that, on this one point, we have not been so successful as we should desire, so that, had it not been for the sum of money received from the sale of our works at Cologne, I do not see how it could have been possible to maintain our dividend at the same rate as on the last occasion. That sum has been scattered over the several works of the association, and we are thus enabled to keep up our dividend to the point which we can now offer. At the same time, I really do not think the results we have to lay before you can have been unexpected by you. I remember, at the last meeting, the high price of coal was alluded to several times, and one of our shareholders stated that he trusted the coal difficulty had then come to an end, and that the price would very speedily be reduced. I concurred with him in hoping that prediction would turn out true, but I ventured also to express a fear that such could hardly be the case. I stated that, during the first three months of the last half year the price we had to pay for coals pressed more severely upon us than in any other three months since the association was established. I wish my view had turned out less correct than it has. I dare say many of the proprietors will remember that when the price of coal first began to rise we stated that the inconvenience of it would not be felt by us in the first half year during which the rise took place, because we were working upon contracts entered into at lower prices, and we were selling at an increased price the coke produced from coal so advantageously bought. That was, of course, to our advantage. Now we are feeling the converse. Coal is reduced in price, but our contracts were entered into six or twelve months ago, so that we still have to pay a high price, and to sell our coke at the best price we can, which is a price corresponding with the low-priced coal of the present period. In addition, we have had an extremely mild winter, so that the demand for coke has been very much less than usual, and our stock has therefore accumulated. This is a somewhat gloomy cloud that hangs over us and our prospects. On the other hand, there are two or three things which have a brighter aspect; and before I allude to them I may just state that I have received a letter from our esteemed president, Sir Moses Montefiore, in which he expresses regret that his health will not allow him to be present to-day, and his hope that the report submitted to the meeting will be satisfactory to the proprietors. Now, gentlemen, with reference to the brighter parts of our prospects. It was stated at the last half-yearly meeting that at Bordeaux we thought we had reason to complain of the treatment on the part of the municipality, and the way in which they had received our tenders for a new contract, and in which, while those negotiations were pending, they had actually signed a contract with other parties. We represented our view of the case to the authorities at Paris, and they concurred so completely in our view that they rescinded the contract—a practice very rarely resorted to, and only in extreme cases. I may take this opportunity of stating, what is mentioned in the report, that in this matter we consider ourselves extremely indebted to Mr. Julian Goldsmid, and that we believe the company are under deep obligations for the great energy and determination shown in Paris, during the negotiations carried on after Mr. Goldsmid left, by our engineer and our agent at Bordeaux—Mr. Da Costa and Mr. Bouscasse. At Antwerp we have been carrying on the negotiations mentioned in the last report, and it was only last week we received information that the contract had been actually signed. At Ehrenfeld, just outside of Cologne, where we still have works, we have completed a contract with two municipalities. In Brussels the authorities first of all endeavoured to obtain a contract on their own *cahier des charges*, the terms of which were so unsatisfactory that the town did not receive a single tender. Since then we have had several overtures made to us, and we have now fair hopes that we shall be able to continue our connexion with that city. Our old works there are required by the municipality to be taken down and removed. This will involve us in great expense. It is possible, therefore, if we get the contract, we shall have to consult our shareholders at large as to the best way to meet the necessary outlay—whether we shall make a call upon the existing shares, whether we shall increase the number of shares, or borrow money on debentures. At the same time, we feel convinced that if we get the contract, and we get the money, we shall be able to carry out the arrangement with satisfaction to all parties. We need scarcely say that we shall not incur any outlay without fair ground for believing that we shall obtain a fair remunerative profit from it. Another point to which I would refer is with regard to the price of coal. During the last half of 1873, our coal at some of the stations cost us about 30s. a ton. During the present year we have entered into some fresh contracts at 20s. a ton; but I may just remind you that we shall not get the full benefit of the reduction, so far as it extends, until, perhaps, the second half year from this time. Still, it is something to look forward to. The mild winter we have just had has caused great accumulations of coke at several of our stations, and the result has been that we have at the present time a stock of about 43,000 tons. We have also lying at different stations very nearly double that quantity of coal, so that in many points our position is satisfactory. I think I may, therefore, say there is a certain degree of brightness in our future prospects, though I am sorry to add that it is future. I do think I should not be acting fairly to the meeting if I did not express my own individual apprehension that our report in November next can scarcely be expected to be much more favourable than the one you now have in the month of May. Those who hear the report in May, 1875, will, I hope, find it more encouraging, and those who hear the report in November, 1875, may possibly hear of greater improvement. I will now move—"That the report upon the affairs of the association now read be received, adopted, and entered upon the minutes."

Some suggestions were made by Mr. TURNER and Mr. PRICE that if the association should require any increase of capital, it would be more advantageous to sell the Consols of the association, which only produced about 3 per cent., than retain them and call up fresh capital from the shareholders, or raise money on debentures at 5 per cent.

The CHAIRMAN, in reply, stated that there was a certain amount of propriety in the remarks made, that an amount invested in Consols would produce less than if it were invested in works. But it must be borne in mind that this was a company receiving a large rental, and paying a large dividend, and therefore need not trouble themselves about the difference in the interest upon money in Consols or in a more profitable investment. It was a mere trifle compared with the importance to the company, at such a period as that of the French and German war, to be able, at the shortest notice, to lay their hands upon £100,000. As far as his own individual advice was concerned, he could not recommend the shareholders to do away with such a small reserve-fund as £100,000, which merely supplied one dividend, and that the directors and he believed a large number of the shareholders had long been anxious to keep one dividend in hand.

The motion was then put and carried unanimously.

The CHAIRMAN: I have now to move—"That a dividend of £1 15s. per share be declared upon the 56,000 shares of the association for the half year ended the 31st of December last, and that the said dividend be payable, free of income-tax, on and after the 15th of June next."

The motion having been seconded, was put and carried. The retiring directors and auditor were severally re-elected.

The CHAIRMAN: Gentlemen, that concludes the business of the meeting. But before you separate I shall ask you to give me leave to move—"That the best thanks of the meeting be given to Mr. G. W. Drory, the excellent general superintendent of the affairs of the Association on the Continent, and to the agents, engineers, and other officers acting under him, for the unremitting attention they always bestow upon the business of the association."

Mr. STOKES seconded the motion, which was passed unanimously.

Mr. PRIDDEN said he had no doubt that a general vote of thanks to the directors would be welcomed by the meeting, but he thought that on the present occasion special mention should be made of the services rendered to the association by Mr. Julian Goldsmid. He had, therefore, much pleasure in moving—"That the thanks of the meeting be given to Mr. Julian Goldsmid, M.P., for his exertions on behalf of the association in respect of the Bordeaux contract."

The motion having been seconded, was carried unanimously.

On the motion of Mr. TURNER, seconded by Mr. PRICE, it was resolved—"That the cordial thanks of the meeting be given to the president and directors for their able management of the affairs of the association, and to the chairman for his conduct in the chair this day."

The CHAIRMAN: Gentlemen, on behalf of my colleagues and myself, I beg to offer you our best thanks. I assure you that no efforts will be wanting on our part to ensure the future prosperity of the association.

The proceedings then terminated.

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

The Annual Meeting of the Shareholders was held at Hanley on Wednesday last—Mr. JOSEPH ALCOCK in the chair.

The report of the directors was as follows:—

In submitting to you the annual statement of accounts, your directors have to report that the water-rental for the year ending March 25, 1874, exceeds that of the year ending March 25, 1873, by the sum of £1549 0s. 8d. The balance for the year ending March 25, 1874, and the previous undivided balance—viz., £206 19s. 8d.—make a total of £5633 14s. 5d., out of which your directors recommend that a dividend at the rate of 4½ per cent. per annum (free of income-tax) upon the paid-up capital be declared, and payable by dividend warrants, to be forwarded to the shareholders on the 25th day of June next. This will absorb the sum of £3764 5s., leaving a surplus of £1869 9s. 5d., out of which they propose to place the sum of £500 to a reserve-fund account, carrying forward a balance of £1369 9s. 5d. to the next year's account. The pumping-stations

and the works generally are in good working order. The sinking operations at the new pumping-station on the Cheddleton Park Farm are being proceeded with as rapidly as possible. There is every indication of this scheme yielding an abundant supply of good water, and your directors confidently anticipate that on their completion they will be enabled to meet satisfactorily the further requirements of the district. Boring operations are also being carried on at the Meir pumping-station, which is expected to yield a considerable additional supply, and also prove the advisability of further extensions in that locality. The directors who go out this year by rotation are Joseph Alcock, John Alcock, Harry Tichborne Davenport, and Charles James Homer, Esqrs., but, being elizible for re-election, offer themselves accordingly.

The statements of accounts appended to the report show, on the capital account, a total expenditure up to May 20 (since the formation of the company in 1851) of £224,521 7s. 4d., leaving a balance of £2632 0s. 10d. On the revenue account the expenditure amounted to £17,768 3s. 6d. (including £500 carried to reserve-fund), and there is a balance of £5133 14s. 5d. available for dividend, after paying which there will be a balance carried forward of £1369 9s. 5d.

The CHAIRMAN, in moving the adoption of the report, said, although the dividend was not so large as many of them could wish, he believed the prospects of the company were brighter than they were at their last annual meeting. The directors were able to present a more favourable balance-sheet, and their prospects, both in regard to revenue and the increase of the water supply, were encouraging. Some of the shareholders might wish to know why the balance was so much in favour of the company as compared with last year. It arose from three causes: first, the improvement of the meters, which were formerly defective, making a difference of £400; secondly, there was the balance on last year's account, amounting to £200 odd, and there had been a larger consumption of water by meter; and thirdly, the new assessments had added considerably to the revenue of the company. It might also be asked why the directors retained so much in hand. The answer was that they had certain claims hanging over them on the part of millowners, and that unfortunate dispute with Miss Clowes was not settled, although both were in train for settlement. The reserve-fund and undivided profits would be absorbed in the settlement of these matters. As the negotiations were not completed, he must, however, request the shareholders not to ask any questions upon the subject, and so perhaps prejudice the negotiations. The matter stood thus: The directors had made certain proposals to the millowners, and they had all but accepted the offer, but the shareholders would excuse him from going further into the subject.

Mr. C. HOLTOM seconded the motion.

Mr. ROUND asked if the expenditure on account of new works at Cheddleton Park was not excessive, and whether it was customary for the directors to employ their own workmen or to let work by contract.

Mr. HARRISON, the engineer, said in some cases the work was done by the company's workmen; it other cases it was let to contractors. The expenditure on the Cheddleton Park works, which amounted to £1600, included every expense up to the present time, including materials and filling up a large space.

Mr. ROUND suggested for the consideration of the directors the desirability of having all work done by contract.

Mr. HARRISON said if the sinking of the shaft at Cheddleton Park had been let by contract the cost would have been much greater than it had been.

Mr. BULL (a director), speaking from his own experience, was not in favour of having sinking done by contract, which he had found a very unsatisfactory mode of procedure.

Mr. HEATH, M.P., quite agreed with Mr. Round that it was desirable to let work by contract as far as practicable; but care should be taken that the contractor was a responsible man, and the principle did not apply to everything.

The SECRETARY, in answer to Mr. Baker, said the increase in the rental of the last year was £1549.

The motion was then put and carried.

Mr. EDGE, proposed the declaration of the dividend mentioned in the report —viz., 4½ per cent.

Mr. BAKER, in seconding the motion, expressed his approval of the policy of setting aside a reserve-fund, and said he would impress upon the directors the importance of considering the growing necessities of the district in regard to the water supply. The Town Council of Hanley, of which he was a member, received continual complaints of the short supply, and at any time the company might be involved in expense through public dissatisfaction compelling governing bodies to take action. It was most important that the directors should take steps to prevent a repetition of the "water famine" of last year, and he suggested that a new main should be laid down from Wall Grange. This matter was one of very great importance, and there was no doubt that the public would insist upon the company making provision which would ensure a regular supply. If that company could not give it, probably other companies would be formed, or attempted to be formed, to meet the deficiency, and it was not to the interest of that company that any such threat should be hanging over them. He knew the directors had done their best, and that they had had great difficulties to contend with; but, at the same time, it was right that they should know what was said about them and what was expected of them.

The CHAIRMAN said the directors were fully alive to the importance of improving the supply, and they were doing all they could to further that end. The cost of a new main from Wall Grange would be £30,000 at least, and, unless they got more water to send through the mains, it would be of little use to lay a new main. They hoped that their present sinking at Wall Grange will give water in quantity sufficient to justify them in laying an additional main from that place.

The motion was put and carried, the retiring directors and auditor re-elected, and the proceedings closed with a vote of thanks to the chairman.

WATER SUPPLY OF THE CITY OF LONDON.

From Dr. Letheby's Twenty-fifth Annual Report on the Sanitary Condition of the City of London, just presented to the Commissioners of Sewers, we make the following extracts as to the

WATER SUPPLY.

The quality of the water supplied to the City has been the subject of monthly examinations, and the average results are expressed in the following tables—the analysis of the water supplied by all the metropolitan water companies being added for comparison.

Average Chemical Composition of the Metropolitan Waters for the Year 1873.

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Common Salt.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
				As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Comps.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	19·67	1·87	0·073	0·133	0·002	15·2	3·6
West Middlesex	18·77	1·81	0·035	0·135	0·001	14·6	3·4
Southwark and Vauxhall	19·41	1·85	0·067	0·122	0·002	15·0	3·6
Chelsea	19·29	1·82	0·079	0·123	0·002	15·0	3·6
Lambeth	19·28	1·83	0·073	0·117	0·002	14·9	3·6
Other Companies.							
Kent	28·25	2·62	0·007	0·224	0·000	21·0	5·8
New River	19·13	1·73	0·033	0·134	0·000	14·9	3·3
East London	19·55	1·97	0·055	0·153	0·001	15·0	3·9

So that the average amount of saline matter in the water derived from the Thames and supplied to the metropolis by the Grand Junction, the West Middlesex, the Vauxhall, the Chelsea, and the Lambeth Companies, has ranged from 18·77 to 19·67 grains per imperial gallon. The water of the New River Company has contained 19·13 grains of such matter per gallon; that of the East London Company, from the river Lea and the Thames, has averaged 19·55 grains; and that from the chalk wells of the Kent Company has been 28·25 grains. The saline matter has in all cases consisted for the most part of carbonate of lime, with a little carbonate of magnesia, sulphate of lime, nitrate of magnesia, and chloride of sodium—the latter amounting to 2·62 grains per gallon of the chalk water, and to about 1¾ per gallon of the Thames and New River sources. The amount of organic matter has at all times been insignificant, for the quantity of oxygen required for every kind of oxidizable matter has not exceeded the 0·079 of a grain per gallon of water—the range has been from 0·007 of a grain for the chalk water to 0·079 of a grain for the worst description of Thames water. The nitrogen, as organic and saline ammonia, has also been remarkably small in quantity, amounting to only a trace in the Kent Company's water, and to less than the one-hundredth part of a grain in a gallon of Thames or New River water. The hardness of the water was generally about 15°, and this was reduced to about 3½° by boiling the water for a quarter of an hour. In the case of the Kent water from the chalk wells, the hardness was 21° before boiling, and 5·8° after.

As regards turbidity, it was noticed that the water supplied by the West Middlesex, the New River, the East London, and the Kent Companies was always bright and nearly colourless when examined in large volume, as in a glass tube two feet in length; but that of the other companies was at times slightly turbid, from the presence of finely-divided clay of a perfectly harmless character.

The quantity of water daily supplied to the metropolis by the several companies has ranged from 101 million gallons, in February, to rather more than 126 millions, in August—the average for the whole year being 111,298,027 gallons per diem. This quantity has been supplied to 502,460 houses, and it averages 221 gallons per house per diem, or 33·4 gallons per head for the entire population of London. The particulars of the average daily supply in each month of the year are as follows:—

Average Amounts of Water supplied daily to London by the Water Companies during each Month of the Year 1873.

Months.	Gallons per Day. Total.	Gallons per Day. Per Head.	Number of Houses Supplied.
October, 1872	108,373,227	32·7	499,786
November, „	103,160,394	31·2	499,973
December, „	100,931,281	30·3	500,229
January, 1873	102,068,405	30·8	501,008
February, „	101,041,923	30·5	501,476
March, „	102,837,479	31·1	501,743
April, „	109,807,217	33·2	503,127
May, „	115,895,425	35·0	503,562
June, „	120,204,176	35·8	503,832
July, „	126,144,369	37·6	504,579
August „	126,240,210	37·7	504,905
September, „	118,874,212	35·4	505,295
Average	111,298,027	33·4	502,460

About 60 million gallons of each day's supply were derived from the Thames, about 47 million gallons from the New River and the river Lea, and the rest from the chalk wells of the Kent Company.

In my last annual report I directed attention to the fact that the Board of Trade had, in accordance with the provisions of the Metropolis Water Acts of 1852 and 1871, sanctioned the regulations made by the companies for a constant supply of water, but it does not appear that the public are much disposed to avail themselves of it, and, therefore, the water companies are themselves gradually making provision for such supply. According to Major Bolton, who is the water examiner appointed by the Board of Trade, the Kent Company have already provided a constant service in Deptford, and they are taking active measures for extending it into other districts. The East London Company have also furnished a like service in many of their districts, and have given notice to the Metropolitan Board of Works of their intention gradually to extend the supply until they have brought the whole of their districts, section by section, into the same condition. In like manner, the West Middlesex and the Lambeth Companies are giving a constant supply of water to houses provided with the necessary fittings; and in the City of London the New River Company have for some time supplied water to the stand-pipes erected by the Commissioners of Sewers in certain of the courts and alleys of the City occupied by the poor, and they have consented to furnish a constant service to those blocks of buildings which I have certified as requiring such supply, it being declared in the 14th section of the Metropolis Water Act, 1871, that when, on the representation of the nuisance authority, it appears to the Board of Trade that a constant supply of water is needed by any group or number of dwelling-houses in a court or passage, or otherwise in contiguity, and that such supply cannot be well or effectually given except by means of a stand-pipe or other apparatus placed outside the dwelling-houses, the Board of Trade may order such means of supply, and the expense thereof shall be borne by the owners. At your request, however, the New River Company have agreed to furnish the supply without the order of the Board of Trade. This is a liberal concession which cannot be too highly appreciated, for it affords the means whereby the poor may obtain cool and wholesome water at all times directly from the main, without the intervention of filthy butts or cisterns. It also prevents waste, and enables us to abolish the overflow-pipes which communicate with the drain, and so bring foul gases from the sewers into the houses of the poor. I have given you a list of places in the City where this kind of service may be advantageously adopted, and I recommend it to your consideration, as it may be some time before the provisions of the Metropolis Water Act of 1871 are fully in operation within the City.

DISCOVERY OF COAL AT BIRMINGHAM.—On Friday morning last, the sinkers in the employ of the Sandwell Park Mining Company came upon a seam of coal six yards in thickness, at a depth of 418 yards from the surface. Since March last, the men engaged at the colliery have been busily at work, and have on an average been penetrating at the rate of five yards per day. Eighteen sinkers have been employed, on the eight hours "shift," working in bands of four, and being relieved by a similar number every four hours. About two o'clock on Friday morning, having bored through a stratum of hard dark shale 10 inches in thickness, the borers, who were using the ordinary drill, penetrated a six-yard seam of coal. The intelligence was speedily conveyed to the pit bank, where several gentlemen—principally shareholders—were waiting in expectation of good news, the fact that the sinkers had struck the "black bat" seam being sufficient to create some excitement amongst those who are interested in the success of the undertaking. The colliery was visited during the day by a large number of shareholders, and a fine specimen of the six-yard measure was exhibited. The bells of Christ Church, West Bromwich, were set ringing to announce the event publicly, and flags were hoisted on the top of the engine-stack to show that the most important stage in this arduous mining speculation had been successfully reached. It may be stated that during last week a coal-field, believed to be of considerable value, was discovered upon the estate of the Duke of Sutherland, near Longton.

GAS MANUFACTURE.

By WILLIAM LONGWORTH, Dukinfield.

[A Paper read at the Meeting of the Manchester District Association of Gas Engineers, held at the Mitre Hotel, Manchester, Feb. 28, 1874.]

First in order and importance in gas manufacture is the arrangement of the retort-house, and the settings of the retorts therein. It does not matter what elaborate machinery there may be about a gas-works, it is very certain that upon the retort-house the weal or woe of a gas company depends. I never yet heard any discussion or inquiry as to what size, in height or width, a retort-house should be, on account, I apprehend, of so very few requiring to be built. I really think that in many cases, in building retort-houses, the size of the same has been simply regulated by the quantity of land at disposal. For instance, if there is a large quantity of land, a large, wide, and windy retort-house is built, the retort-bench being, of course, placed in the centre, and looking very much ashamed of its pigmy appearance in a house that should solely be devoted to its service. It is some alleviation to find that part of the cold-air space in such barracks is materially lessened during the summer months by the storeage of cannel and coal, but at mid-winter, when the stock of cannel and coal is daily lessening, so surely also is what should be a retort-house gradually developing itself into an ice-house, and the stokers, when drawing or charging, experience the equator on the bridge of their nose, and the North Pole at the back of their head.

I maintain that the retort-house should be as narrow as is compatible with the proper drawing and charging of the retorts, and that the inlets to the retort-house should be as few and as small as possible. There is no gas-works in our district whose retort-bench is more than 20 feet wide, and 15 feet on each side of bench is ample working space, thus making 50 feet wide inside measure. No doubt you think that 60 feet wide is better, but I am of opinion that any excess of 50 feet is simply storeage for cold air. In our district we have many retort-houses 50 feet wide, and I never yet heard any complaints from the stokers employed therein. I should never recommend a retort-house to fulfil the extra duty of cannel and coal stores. The stores might be under the same roof, but divisional walls, with proper openings, should divide the retort-house from the cannel stores. The walls of the retort-house are plenty high enough at 18 feet. Ventilating windows or openings should be made in the walls every six feet, and on a level with the top of the retort-bench. The roof to be of a pitch proportionate to height and width of the building, and to have a 4-feet open ventilating roof the whole length. I cannot understand why an ordinary-sized retort-house should be three or four masted—*i. e.*, have three or four chimneys in place of one. I should think that one chimney of decent proportions, built in centre of retort-bench, would answer every purpose as to draught, and it appears to me more practical and more to be desired on sanitary grounds, for the reason that a large proportion of sulphur ascends the chimney of the retort-house; and it is more desirable that it should be conveyed away by one high chimney than by three or four low ones.

I now come to the retort settings, and would ask, "What is the best form of retort setting?" My answer would be—"That form which in a given arch space has the largest efficient carbonizing area and the smallest fireplace." By carbonizing area, I mean the area of the bottoms of the retorts or ovens. For the purpose of comparison and argument only, I will say that our fire arch at Dukinfield is 8 feet wide and 6½ high to crown of arch. In that space we have near 80 feet of carbonizing area, from which we could produce at a push 25,000 feet of gas per 24 hours, using, of course, the best local cannel. Our usual make is from 19,000 to 20,000 feet, with 50 per cent. coal and 50 per cent. cannel. We have only three retorts or ovens in each setting, two being 2 feet 3 inches × 9 feet, and one being 6½ feet × 9 feet. I do not, gentlemen, quote this as anything grand, but simply to help us with comparisons. It is of the utmost importance that all coal and cannel should be weighed in the stokers barrows before being placed in the retorts, and I will not insult you, gentlemen, by taking up your time to quote the many reasons in favour of barrow weighings.

I do not purpose to say anything touching upon the various kinds and qualities of coals and cannels for gas-making purposes. As appertaining to drawing and charging retorts by machinery, I do certainly believe that up to the present time the *man stoker* is by far the best machine. We have many a time been prospectused and circulared *re* stoking machines, but I am sorry to say that as yet steam stoking machines have only been productive of a "free outing" to inspect them. However, all honour, say I, to those gentlemen who have laboured hard and long in doing their best to provide gas companies with a much needed desideratum. It has just come to my knowledge that Mr. Foulis, of Glasgow, has completed a water stoker, and that very high hopes are entertained of its suitability. I shall hope to find in Mr. Foulis the "coming man," and will take a leading part in singing "Hail, the blest day." I must confess that a drawback to the steam or water stokers will be the great cost of same, as I should apprehend every gas-works who adopt them cannot do with less than three machines—one for each side of the retort-bench, and one for emergency. One machine only at a work is no desirable attainment. For instance, suppose it should break down on a dark winter's day. Three or four stokers absent is bad enough, but if the whole "shift" refuses, the consequence would simply make the gas manager "sit up."

If there is one thing less discussed than another appertaining to retort settings or heating of same, it is the "fire-bars." The great share they have in "efficient carbonizing" has been greatly under-estimated, if ever estimated at all. The provision of suitable fire-bars for the various classes of coke consumed is of the utmost importance. I myself have known instances where retort settings have been condemned, the fault being simply in the fire-bars; they being so close together the whole length as to prohibit the admittance of air, consequently the mass of coke simply smouldered, and when other and suitable bars were affixed, the change in the heating of the setting was at once perceived. I should recommend for the burning of the coke, in our locality, a cast-iron fluted bar with notches at centre and ends cast on so as to leave an air pass of 1¼ inch between each bar. Of course, the size of the air pass depends entirely upon the quality of coke consumed. Wrought-iron bars are objectionable on account of their swelling and clogging up the air pass. This fire-bar question certainly deserves a little more attention from us, and I hope that at our next meeting we shall be enabled to compare fire-bars, and interchange thoughts upon them. It is customary in many places to have the mouthpieces of the retorts considerably less than the retort itself; such, I submit, is a mistake, the mouthpiece should be flush with the retort—*i. e.*, the same size in height and breadth. This makes the drawing, charging, and scurfing much easier, and also produces a larger coke. The ascension-pipes should be as large as possible. My own at Dukinfield are, for the large ovens, 8 inches diameter at bottom and taper to 7 inches; for the small ovens, 6 inches diameter at bottom, and taper to 5 inches.

We now get to the first calling-place after the gas leaves the retort—viz., the dip-pipe. This is another very important subject in gas manufacture. It is of the greatest importance that all dips should be equal, and I suppose every gas manager is sure that at his works all dips are equal. Well, I should recommend that a trial be made, and the manager will be astonished at the result of the trial. One inch, I suggest, might be taken as the proper dip. Now, we have that most beautiful contrivance, the hydraulic main. The never-failing manner in which it performs its share in gas manufacture is patent to every gas engineer. It does not matter whether the shape is round or square, the working the same—efficient, shape being merely a matter of fancy. We have of late been favoured with many novelties appertaining to rearrangement of dip-pipes and the hydraulic. I should not at present recommend those old friends to be disunited by any means yet known to us. At Dukinfield I have, on the outside wall of retort-house, a trunk main, to which I convey the gas and tar from the hydraulic main, having a separate hydraulic main and convey-pipe for every eight fires—*i.e.*, four front and four back. I think it a great mistake to affix long lengths of hydraulic main, as, if any breakage or giving way were to take place, the longer your length of hydraulic main the more retorts thrown out of gear. Short lengths of hydraulic mains, with separate convey-pipes, to a trunk main, cannot do other than greatly ease the passage of gas and tar from the retorts and hydraulic. As to what should be done with the gas when it leaves the hydraulic is a matter of much discussion. We hear repeatedly that the gas should be gradually cooled, but as to the proper meaning of gradually, in gas manufacture, nothing definite can be quoted. Is there such a phrase as gradual—which, I take, means slow cooling—in gas manufacture? How long does it take the new-made gas in the hydraulic to pass through all the apparatus and reach the gasholder? As soon as the gas is born it is instantly pulled and pushed along, and in not more than five or six minutes it is in the gasholder, and many a time out in the town in five minutes more. What, now, is the mode adopted in some of our model works for gradually cooling the gas? Immediately on leaving the hydraulic main the gas is made to ascend an enormous mass of coke, which said coke has continually large volumes of ammoniacal liquor pumped upon it, and which cold liquor meets the hot gas, and is supposed to have such an affinity for all that is vile in the gas that I really wonder why anything other than scrubbers are used for purification. Well, gentlemen, in this instance, the word gradual is certainly a misnomer. I believe that a greater mistake in gas manufacture could not be made than to at once take, as it were, all the life and elasticity out of your hot gas by such a cruel drenching of liquor as performed now-a-days—viz., immense volumes of liquor always being pumped on the mass of coke, irrespective of the quantity of gas passing through the scrubbers. The only merit claimed for this cataract business is that it is presumed to take out some portion of the ammonia from your gas, and deposit that ammonia in your gas-tar tank. The real merit is, I apprehend, in making your liquor stronger about 4° per week's hard pumping. Looking at scrubbing in the light of purification, I am so dull of comprehension that I cannot believe that the same chemical actions or affinities are constantly taking place in the scrubbers during the passage of liquor varying in strength from 3° to 10°; nor can I believe that gas, having been scrubbed by liquor of 3°, is in possession of the same elements when scrubbed by liquor of 8° or 10°. Your scrubbed liquor is not so marketable as unscrubbed liquor. Your liquor is lessened in quantity rather than increased, if fair play be exercised, and I doubt not but that in a very short time we shall be ashamed of having put to death by drowning many of those illuminant compounds which coal and cannel would give us if we would let them. I should very much like to know to what extent carbonic acid is visible in gas where there is scrubber pumping, and *vice versâ*. By the way, allow me to remark how strange it is that we should be always guarding against ammonia and sulphuretted hydrogen, and yet have so little acquaintance with carbonic acid in our gas. Where oxide purification solely is done, I am sure of the presence of carbonic acid, one simple reason being that oxide has no affinity for carbonic acid; and when we know that 1 per cent. of carbonic acid in our gas diminishes the illuminating power 6 per cent., I think carbonic acid deserves a little more inquiry after than we give it. Of course, in gas with all lime purification, carbonic acid is, or ought to be, unknown. Scrubbers, when first introduced, were intended to free the gas from all tarry matter; then came pumping liquor in small quantities, the delivery-pipe at the top of the scrubber being reduced so as to cause the liquor to discharge itself with such force on a brick or other hard substance as to cause the diffusion of liquor as spray, which gently trickled through the scrubber to prevent the congealing of the mass of coke. This is my idea of scrubbing still. Increase or decrease the volume of liquor with your make of gas in fair proportion. I do really wonder on seeing, at the present day, such Eddystone Lighthouse scrubbers combined with the avalanche business, how in the name of goodness any element other than ammoniacal vapour reaches the outlet. Would not a small washer answer every purpose of these monstrosities? I think so, and better than they do. Force your gas through about four inches of liquor in a washer; keep continually running in and out of the washer ammoniacal liquor, until your required strength is obtained; then "Simpson" if you like, and so on again and again. You have no need of separate engines, pumps, distributing-gear, and all the other attendant scrubber paraphernalia in this almost forgotten washer, which did once answer every purpose of intention, and will do so still. You will see, gentlemen, that the washer will ere long come again into glory, and the scrubbers retire into oblivion.

We were always given to understand that the longer the gas is in contact with the tar, the more free it is from all impurities, inclusive of naphthaline, and the more rich is the gas in hydrocarbons; consequently, it should be our aim to keep our new-born tar and gas together as long as possible, but we have been unable to do this for want of proper apparatus. Some engineers have done so by running a pipe around their retort-houses, conveying therein all the tar and gas from their hydraulic main; a very capital plan, and one that brings in the words "gradual cooling." Another plan is the horizontal condenser, recently brought under our notice by a member of our association, Mr. D. A. Graham. This condenser is by far the best thing appertaining to gas manufacture that has been brought to our notice for many years, and as at this meeting Mr. Graham will bring his apparatus before your notice, I do not desire to defraud him by making prior statements of results, but I have such belief in it that at Dukinfield I have taken down vertical condenser and scrubbers, and am erecting an horizontal condenser as per plan on the table, feeling fully assured that it will very soon pay for itself and its departed brethren. When the gas leaves the horizontal condenser, I would conduct the same to one large receiver or scrubber, filled partly with deep thin boards placed half an inch apart, my object being to cause the gas to deposit a good portion of tarry matter on the boards, which would trickle down and be syphoned off in the usual way. I have a scrubber which has been at work four years on the board system, and when we recently opened it, the gas-way was so clean and clear that I immediately closed up the scrubber, and intend to inspect again in another four years. From this scrubber I would convey the gas to a water condenser—*i.e.*, a horizontal condenser with the pipes buried in the water cistern, and this cistern should supply the works with water, thereby certifying the water to be at almost one temperature. Here this water condenser takes up the gradual cooling from the horizontal condenser, and works the gradual most effectively; the gas in a lessened degree keeps depositing its tarry matter, which is syphoned off as before.

Next comes the exhauster, and though I may now appear to make a statement which will take many engineers by surprise, yet, when I say that "Jones's exhauster" is by far the best of any, I perfectly well believe in the truth of such a statement. Doubtless you all know the exhauster, with its two rotary cams, and without any rubbing solid parts or friction. Every revolution of the driving pulley gives four distinct discharges of gas, which thus passes in a steady continuous flow, showing the slightest possible movement in the gauge. It is true these exhausters make rather more noise than others in working, but efficiency is preferred with a little noise than inefficiency noiseless. I know a great deal of difference of opinion will exist as to my statement, and I shall be glad to alter my exhauster opinion, if, on comparing results, my statement shall be proved untenable in point of cost, efficiency, wear and tear, steam power, or any other matter bearing upon the question.

We are now at the outlet of exhauster, with the gas quite moist, and still

depositing a small quantity of tar. The gas requires now the purifying-house, which should always be built as far from the retort-house as possible. At Dukinfield, the distance from the exhauster to purifiers is near 80 yards; 55 yards of that distance, and from outlet of exhauster, I have the convey main hung to the outside of a retort-house wall, at a gradual slope to a syphon-box, from which flows daily from 10 to 40 gallons of very thin tar, the difference corresponding with gas make. We pass our gas, unscrubbed and undrowned, through near 580 feet of good-sized pipes, all above ground, and if the gas will leave its faithful tar at the 579th foot, I shall be obliged to it, but not one foot earlier do I want their farewell of one another. Our make is 60 millions, and I do not consider I have one foot too much condensing power. Condensation on the gradual system is the father to purification, as it is by condensation alone that the rich gases disentangle themselves from their poor and impure brethren, sending the latter to the chemical works, whilst the former raise the gasholder. The purifying-house should always be built of two storeys, thereby affording plenty of room and light to inspect or clean the connecting-pipes of the purifiers. I do not see any occasion for purifiers to exceed 2 feet in depth. It is a mystery to me why those engineers who use lime for purification should keep up the four or five tiers of grids, when one tier would answer every purpose, and effect a great saving of time and labour. I know no reason why hydrate of lime should not be placed in the purifiers the same as oxide—viz., 18 inches or 2 feet deep. Oxide of iron purification is by far the cheapest method of purification, the cost for oxide alone being about 7s. 6d. per million feet. The oxide is, of course, delivered to the owners when fully charged.

It may not be amiss to mention here the great superiority of the Thorncliffe dry centre-valve, which, in order to change your purifiers, simply needs turning one quarter of a turn. How much better than the old water-valve, with all its necessary cranes, chains, wheels, liftings and turnings, and letting down again. In one of my former papers I stated that if your gas be purified wholly with lime, and leaves untouched the lead test, then your gas is as commercially pure as need be. I say so still. Bother none with the bisulphides, nor any of their aunts and cousins, with all their fancy glass appurtenances. If any person wishes to know what amount of cyanogen you have in your gas, give him some gas to experiment upon. We all know what cyanogen is, and how it unites either with ammonia or with sulphide of ammonium, and thus forms cyanide of ammonium, or sulpho-cyanide of ammonium. Very interesting and very practical! Mind you, I love good practical chemistry, but I fearlessly state that more bad gas has emanated from these splendid laboratories than ever went in them. Here, then, we leave the gas at the outlet of the purifiers, manufactured, and only requiring to be measured and stored, with which I do not at present propose to deal. I know full well what disadvantageous circumstances gas managers have to contend against, for the simple reason that extensions on gas-works are made with a view to last 10 or 20 years; consequently much money is spent, and thus in matters of carbonization, condensation, and purification, many gas managers have to content themselves to wait and wait for improvements at their works until their old settings and apparatus are used completely beyond repair, or are much too small for the gas requirement. We all in this labour at a disadvantage in some respect, but that does not make us less proud of our profession, and it is but honest envy that we feel when we cannot, like some of our neighbours, have seven in a bed, 11,200 per ton, and 11 per cent. leakage.

To sum up, gas manufacture consists simply in three words—viz., carbonization, condensation, and purification; and if these three are properly carried out the resultive word "illumination" is sure to follow.

Our carbonization should, in fact must be, conducted on the best known principle of retort-settings.

Our condensation must be gradual, and true to the name. Horizontal air condenser first; dry board scrubber second; horizontal water condenser last. Have your apparatus large enough, and keep your gas and tar together as long as possible.

Our purification, by hydrate of lime alone or combined with oxide of iron. Where four purifiers are fixed and at work, always turn on a clean purifier when the second one touches the acetate of lead test, thereby enabling you at all times to have a gas as comercially pure as need be. The testing of gas for illuminating power has by the jet photometer become so simple, and is so well known, as not to require a word from me concerning the said testing.

I sincerely hope and trust that the time is not far distant when all the gas companies in the kingdom will be making one uniform quality of gas, and that quality 15 candles. Fifteen-candle gas will not stand grumbling at, if properly consumed, and I certainly do think it rather a waste of a material which is too fast going out of being, that such material should be used where certainly not required. What would be the consequence if 15-candle gas was universally adopted? "Universal grumbling," you, on first thought, would say; but what on second thought? I should say that if 15-candle gas was universal, then would the wise and skilful, who depend upon our profession for bread, club together their brains with a result that, in an incredibly short time, burners and other apparatus would be forthcoming, that would make our 15-candle gas give the same amount of light as our present 18 or 20 candle gas. I am so positively convinced that we have not the slightest necessity for using cannel to produce good gas, that had I a competence I would devote a period of time solely to the successful carrying out of my conviction. As it is, the engineers and managers (in Lancashire especially) are occupied rather too much in manufacture and management upon the present system, as to forbid any devotion to the bettering of the same.

I should take it as a great favour if every member of this association would, at an early date, favour the secretary with a description of the retort-settings at the works of which he is the engineer or manager, stating the carbonizing area, width of fireplace, and every other particular, including cost of setting. It is only by this means that we can derive any idea as to the best system of retort-setting. It is no good for a day only to read a paper on any matter, unless the paper be followed up and never lost sight of until the import of that paper is fully realized. For instance, we desire to know what gas-works have the best setting of retorts in our locality. Well, it is only by complying with my request, just made, that we can know where the best setting of retorts is situate. I therefore hope that, prior to our next meeting, the committee will draw up a list of questions as to retort-settings, and cause the same to be forwarded for answers to not only every member of our association, but also to as many other gas engineers as possible, with a request that they will kindly return answers to the questions, and then let the whole returns be summarized and laid before our members.

And now, gentlemen, in conclusion, I cannot say that I am altogether pleased at all that I have advanced, for the simple reason that in all my statements on gas manufacture I have simply followed the course adopted at the works of which I am the engineer; but, as I before observed, not at all on account of laying the slightest claim to merit, but simply to form a foundation from which to raise a superstructive discussion, which, I trust, will be productive of some good. I really believe that, should some of us live another 20 years, we should then be ashamed of the gas-making of our present *enlightened* period.

I now conclude by thanking you for the kind and attentive manner in which you have borne my lengthened remarks; and I assure you that if any part of it has afforded you the slightest pleasure, I shall be fully compensated for any extra pressure put upon me during the busy season of the year, and that I shall always consider the same simply as a labour of love.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Owing to the Whitsuntide holidays, all the larger iron-works, foundries, and most of the collieries, have been idle during this week, or the greater part of it. Operations will, in most instances, be resumed on Monday or Tuesday morning. There has, consequently, been but little change in the state of the market, but it may be noted that pig iron is nominally stiffer, the following being the quotations for Cleveland brands at the works, or f.o.b. in the Tees:—No. 1 foundry, 82s. 6d.; No. 2 foundry, 77s. 6d.; No. 3 foundry, 75s.; No. 4 foundry, 65s.; No. 4 forge, grey, 60s.; No. 5 forge, mottled, 59s.; No. 6 forge, white, 57s. 6d.; refined metal, 80s.; Kentledge, 75s.; and cinder, 50s.; all not cash. Derbyshire and other pig iron remain nominally as heretofore.

In the steam coal trade there is a fairly good, but not a pressing, demand, which is being easily met. Shipments from the Humber ports are not, so far, on a very large scale, and, indeed, are hardly likely to be so during the summer. Prices are nominally 12s. to 16s., but there are plenty of instances in which colliery proprietors are making special terms in order to meet customers views.

On Thursday, at the adjourned meeting of the South Yorkshire colliery proprietors, a deputation attended from the South Yorkshire Miners Association, and, after a mutual explanation, it was agreed that the men be asked to accept a reduction of 10 per cent. on the gross earnings, to take effect from May 20, or to accept a reduction of like amount for a period of two months, and to afterwards agree to whatever drop might be awarded by Mr Rupert Kettle to the West Yorkshire miners. The Miners Association will give their reply on Monday next. In the evening a mass meeting of miners was held, when some very strong language was indulged in, both as to their own delegates and the conduct of the coalowners. It was supposed that a section of the men will decline to work at any reduction.

The Duke of Norfolk's Sheffield Collieries are about to be transferred to a limited company.

At the Lindley Wood reservoir of the Leeds Water-Works about 58,600 cubic yards have been put into the puddle trench, the two culverts have been finished, and valve towers built to a height of about 50 feet above their inverts. The bye-wash is being excavated and fitted with masonry. The main embankment has been raised to within 20 feet of the top, or within 14 feet of the water-line. Two miles, out of a total length of 3¼ miles, of the boundary wall round the reservoir have been completed. The total amount so far expended on this reservoir is about £156,000, and it is expected that it will be finished by the end of this year. At the Fewston reservoir nothing more has been done, but it is stated that the total expenditure upon the Washburn supply up to the 30th of April, 1874, was £483,250, of which £135,195 were for the Act of Parliament, purchase of lands, compensations, &c. With reference to the Leeds sewage works, it ma y be stated that most of the machinery, &c., is fixed, and experiments are being made on about 1 million gallons per day. The total expenditure on these works so far is £38,000.

THE NORTHERN COAL TRADE.

(FROM OUR OWN CORRESPONDENT.)

Notwithstanding the fact that the great strike of iron miners in the Cleveland district has extended over more than a fortnight, it has not altered trade much from what it was before the late strike of the colliers in the county of Durham. The household pits are doing middling well, at prices ranging from 15s. to 16s. per ton. Best West Hartley steam coals do not change much, from 18s. per ton, with the usual discounts; but small coals fell from 20s. to 16s. per ton last week. The Imperial Gas Company made some large contracts last week with several of the collieries; but the coalowners have been somewhat reluctant to indicate the price at which they were made; but they were pretty much off and on about 19s. per ton delivered at the works in London, which is something like 13s. per ton at the pit's mouth. Last week was a broken one at the collieries on account of the Whitsuntide holidays; but sufficient coal was brought to bank to meet all the requirements of trade.

Tonnage was far from plentiful as before; shipping rates were not so firm, however, as before. Freights to London were from 6s. to 6s. 6d. per ton; and the same to Rochester; Poole, 7s. 3d.; Penzance, 7s. 6d. per ton; Dartmouth, £7 5s.; Plymouth, £7 to £7 10s. per keel. The following rates have been accepted to France:—Dieppe, £8; Trouville, £8 5s.; Fécamp, £8. Baltic rates are not quite so firm. There is singularly little change in general trade week after week. It keeps uniformly dull, and the same report of the want of orders and dull business comes from the Continent. There are few shipments, except fire-clay goods and iron. The ironstone miners still obstinately hold out, but the Cleveland ironmasters are getting a good deal of ironstone from Northampton. If an understanding is not come to with the miners soon, a good deal of the iron trade of Cleveland will be brought to a standstill. Labour keeps abundant in the North. Most trades, except engine-builders, have more hands than they can very well do with.

BIDEFORD GAS COMPANY.—The half-yearly meeting was held on the 16th ult. The report of the directors stated that the works are now in a satisfactory condition; that a main-pipe has been laid in the Abbotsham Road for the purpose of lighting the villas there, and that as the cost of coal is being reduced, they contemplate a reduction in the price of gas by allowing a discount on prompt payment from and after Michaelmas next. The income for the year has been £2402 3s. 5d., and the expenditure, including extension of stock, £2160 17s., leaving, with the surplus of last year, a disposable balance of £599 19s. 9d. A dividend of 6 per cent., free of income-tax, was declared.

APPOINTMENT OF MEDICAL OFFICER TO THE CITY OF LONDON.—At the meeting of the Commissioners of Sewers, on Tuesday last, the Sanitary Committee brought up a report relative to the duties and emoluments of the medical officer of health and food analyst, both of which offices have lately become vacant by the resignation, through ill-health, and after 20 years service, of Dr. Letheby. The report contained a recommendation that the commissioners should advertise at once for candidates for the offices, jointly or separately, and should fix a day for receiving the applications and for the election. Deputy Farrar protested most earnestly against what he called the shabby, and almost dishonest course of advertising for candidates for an office, when it was known for a certainty that any stranger who presented himself would be rejected. The commissioners ought not to shut their eyes to the fact that a certain candidate, a member of the Court of Common Council, as it had been given out, had already received the promises of the majority of the commissioners, and was quite certain of being elected. He therefore appealed to them not to deceive either the public or the medical profession by a pretext of fairness which, in reality, never existed. He added that the commissioners, in electing their medical adviser, had an important public trust to fulfil, and he hoped that the great prestige of the office would not suffer by their choice. Mr. F. Cox also contended that it was "a perfect sham" to ask men of eminence and position to apply for an office, when a majority of the commissioners, as he was told, had already promised their votes to a particular gentleman. The chairman warmly protested, as did also Mr. Bedford, Mr. Knight, and Mr. Clark, against those observations, and said the commissioners had only one object in view—namely, to secure the very best man for the post. Mr. E. Davis asked whether a member of the Common Council was qualified for an office in the gift of the commission. The chairman held that such a question was not then pertinent, but said he should be perfectly prepared to answer it at the proper time. Eventually the report was carried, and the election was fixed for that day fortnight.

TESTIMONIAL TO MR. LONGWORTH.—On Wednesday last, the quarterly meeting of the members of the Manchester District Association of Gas Engineers was held in the Mitre Hotel, Cathedral Gates, Manchester. There was a very large attendance to witness the interesting ceremony of presenting a testimonial to Mr. William Longworth, manager for the Dukinfield Gas Company, and president of the association. Mr. Longworth has been the honorary secretary of the association since its formation, and it was considered that he had conferred such services in that capacity as merited some substantial acknowledgment. Accordingly it was resolved to present him with a testimonial in the shape of an address, accompanied by a silver inkstand. The address is written on vellum, and highly and richly illuminated, and set in a costly gilt frame. It is the work of Messrs Meredith and Ray, of Manchester, and is a fine specimen of art. The inkstand consists of a massive plate of silver, elaborately chased and figured. It contains two ink bottles mounted in silver, with a silver cup or vase between them of an urn shape, intended as a receptacle for wax, wafers, &c., and has a socket in the top or lid for holding a wax taper. The whole design is very beautiful, and the workmanship rich and chaste.—The address is in the following words:—

Manchester District Association of Gas Engineers. To William Longworth, Esq.

Dear Sir,—On behalf of the members of the above association we desire to show some mark of our appreciation for the many valuable services rendered by you to our association, and we feel that we cannot do so on a more fitting occasion than on your retirement as honorary secretary. We heartily congratulate you on your appointment as president of our association; and for the unremitting attention to, and faithful discharge of, your duties as honorary secretary for the last four years. We have great pleasure in presenting you, as a token of our sincere regard and esteem, with this testimonial and accompanying inkstand. We trust that this manifestation of our approval of your past services will be acceptable to you, and we earnestly hope you may be long spared to continue to our association that assistance which has proved so efficient and beneficial to its interests from the time of its formation.—Signed on behalf of the members of our association,

JAMES PATERSON, Treasurer.
JAMES BRADDOCK, Hon. Sec.

Committee { JOSEPH WOOD. SAMUEL HUNTER. / JAMES JACQUES. JOHN COCKCROFT. / HARRISON VEEVERS. WM. THOM. ROBERTS.

Manchester, May 27, 1874.

The inkstand was inscribed as follows:—

Presented to William Longworth, Esq., by the members of the Manchester District Association of Gas Engineers, as a token of their esteem for the able and efficient manner in which for four years he discharged the duties of honorary secretary to the above association.—May 27, 1874."

Mr. Jacques, the late president, made the presentation in appropriate terms, and it was suitably acknowledged by Mr. Longworth.

BURSTING OF RESERVOIRS IN AMERICA.—Particulars have reached England of the extraordinary disaster in Massachusetts on the 16th ult., to which we referred in the "Water and Sanitary Notes" the week before last. The *New York Tribune* says that on part of the Mill river, a small tributary of the Connecticut in Hampshire county, there are three large reservoirs for the use of the factories which line the banks of the stream along its whole course. One of these burst suddenly between eight and nine a.m. on May 16, and the imprisoned waters were hurled with tremendous violence upon the villages below, while some of the inhabitants were not yet astir, and others were just going to their work. The southern half of the village of Williamsburg was almost obliterated, and the advancing torrent then swept over the villages of Skinnersville and Leeds, destroying all the principal factories and a great number of dwelling-houses. The disaster was so sudden that hardly anybody had time to get out of the path of the water. The flood poured through the narrow curve formed by the hills on each side of the mill river, demolishing everything before it, and carrying down an awful *débris* of shattered timber, broken machinery, uprooted trees, and mangled corpses. At Florence, eight miles below Williamsburg, the country becomes more open, and the torrent spread itself over the meadows, and so spent its force at Northampton. However, three miles farther on the swollen current of the river demolished several bridges and interrupted railway travelling. The bursting of the undermined wall was not anticipated, and the first warning people had on rising from their breakfast-tables was the sight of a mass of drift wood, as high as the eaves of a two-storey house, roaring down the road, sweeping everything before it. The mill river rises in the town of Williamsburg, and runs in a south-easterly direction until it empties into the Connecticut. The river in the summer being subject to severe droughts, the volume of water is kept uniform by two great reservoirs at Goshen and the other at Williamsburg. The river is liable to sudden "freshets," and, owing to its narrow valley, rises to a great height. The Williamsburg reservoir has always been considered unsafe, and, at times, serious apprehensions have been felt by dwellers in the valley. It had an area of 104 acres, and was made by damming up a valley between two mountains. The dam was 400 feet long on the top, and 65 feet wide at the bottom, sloping gradually to the top. It consisted mainly of the ordinary gravel, and in the centre of it rose a wall of masonry of rubblestone laid in waterproof cement. The wall was 4 feet wide at the base, and tapered wedge-like almost to a point of the other top. The great defect seems to have been the wall of masonry at the dam, its width, and its material. In one place the foundation was laid on solid rock, but in another place merely on the gravel. It was here the water was first seen leaking through the bottom. Seven or eight years ago the county commissioners pronounced the work to be safe. The wall, however, was concealed from view, so that the faults in its construction could not be noticed. The loss of life is estimated at nearly 200, and the destruction of property at 1½ million dollars.

Register of New Patents.

2901.—YARROW, E. H., Camberwell Park, "*Improvements in the manufacture of gas for lighting and heating purposes, and in furnaces and apparatus for the same.*" A communication. Patent dated Sept. 3, 1873. (This patent is void by reason of the patentee having neglected to file a specification in pursuance of the conditions of the letters patent.)

This invention relates, firstly, to improvements in the manufacture of gas from petroleum, oil, or other cognate materials suitable for lighting and heating purposes, the gas as employed being composed of vaporized oil in conjunction or not with air or other body under pressure, according to the kind of flame required and its purposes.

In the manufacture the oil is permitted to flow, or it is forced on to floors or partitions within retorts, so that it flows or trickles down or along from one floor to another and takes up the heat of the furnace in which the retort is arranged. The oil by the time it has traversed the series of floors has given off the whole of its illuminating properties which are drawn off or sent into a receptacle to be used when desired, the receptacle being preferably like an ordinary gasometer. The gas thus made can be sent direct to the gasometer in a heated state, or it may first be cooled down for storeage. In most cases the oil is in a crude state, but it may be passed through stills or purifiers before it enters the retorts for its conversion into gas.

The retorts are in one piece, or in several pieces, with lips and grooves which correspond, so that the whole can be held together by metal bands or other devices, and any number of retorts can be built upon the same brickwork or structure, with as many fires below or around as are required to heat the retorts, the oil being preferably fed in when they are at a bright red heat.

The gas can be used in conjunction with air from a blower for heating purposes, and the flame or flames can be directed into any position. The blast of air can also be blown across the face of the burning oil, which it is proposed should be in a pan, say, in the mouth of a furnace, for the blast to carry the flame into the flue and against the boiler skin, the pan having a muffle upon it to confine the current. For reverberatory furnaces the gas can be passed through a tube containing the blast-pipe, so that the force of the blast distributes or sprays the gas.

2954.—WILSON, A. F., Buckingham Street, Adelphi, London, "*Improvements in apparatus used in the manufacture of gas and in the production of some of its constituents.*" Patent dated Sept. 8, 1873.

This invention relates to the manufacture of gas from coal or other suitable substance, and subsequently combining it with hydrogen obtained from the decomposition of water; and consists in building an oven wherein a number of retorts are set, inclined and diagonally to each other. They are also made taper, the largest part being downwards, and are connected by a bend to the inner tube of a Cornish boiler, or to a hot coke chamber partially surrounding an ordinary egg-ended boiler. In the walls dividing the benches iron tubes are inserted, and in the angles unoccupied by the inclined retorts other retorts are set, each containing a cast-iron tube and a series of wrought-iron tubes, together with a subsidiary furnace. In the angle between the upper part of the inclined retorts, another retort is set.

Coal being supplied to the retort from a hopper by a screw or plunger, distillation begins, the gas ascending to a hydraulic main and from thence to the central retort before referred to. As fresh coal is introduced the coke from the retort is pushed or caused to slide down into the hot coke chamber, or inner tube of the boiler, when it communicates heat to the water, which is converted into steam, and is conveyed to the tubes in the division walls, where it is superheated and decomposed by the action of unoxidized scrap iron. The hydrogen thus liberated passes to the central retort, where it mingles with the coal gas, and is then drawn off to the condensers and other appropriate apparatus for purification and storeage. Openings are provided so that the coke from the hot coke chamber, or inner tube of boiler, when deprived of its heat, may be removed into trucks or waggons placed below to receive it.

2971.—HOLLAND, H., Birmingham, "*Improvements in the manufacture of gas for illuminating and heating purposes.*" Provisional protection only obtained. Dated Sept. 10, 1873.

The specification of this invention describes manufacturing gas for illuminating and heating purposes by combining atmospheric air with hydrocarbon liquid or with the vapour thereof, and submitting such combination to the action of a red heat, either with or without the aid of lime, chalk, burnt clay, pumice-stone, coke, or other suitable substance.

2994.—CLARK, A. M., Chancery Lane, London, "*Improvements in screw-valves.*" A communication. Patent dated Sept. 11, 1873.

The invention consists of a valve so constructed that the valve-plug may be conveniently ground to its seat without detaching the valve from its connexions, which result is obtained by means of a valve made in sections, and provided with lugs having screw threads cut upon their outer surfaces in combination with the screw of the valve stem, the cap nut, and body of the valve.

3004.—WINN, C., Birmingham, "*Improvements in gas-lamps.*" Provisional protection only obtained. Dated Sept. 12, 1873.

This invention refers to hall and vestibule lamps and other gas-lamps similarly suspended, and consists of the following improvements for facilitating the removal of the globe or shade from the frame of the lamp. The frame of tubes is made of sufficient diameter at or about its middle part to permit of the globe or shade passing into or out of it by a lateral motion; and in the lower part of the frame one or more seats are made on each tube for supporting the globe or shade. The globe or shade, being introduced into the frame at the wide part thereof, is carried down vertically, and made to rest on the said seats. To remove the globe or shade it is lifted vertically from the seats, and removed from the frame at the middle or widest part by a lateral motion.

3005.—VALON, W. A., M'INTOSH, Ramsgate, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated Sept. 13, 1873.

This invention consists in arranging the hydraulic main which is constructed with a water-trough on its top, so that the ascension-pipe shall enter its bottom. Directly over each ascension-pipe a hole is formed in the top of the hydraulic, and around the hole a short upright pipe or cylinder is attached. A cap or cover is made to pass over this pipe and dip into the water in the trough. Fixed to the top of the interior of the cap is a pipe of such size as to admit of its passing freely through the short upright pipe and over the ascension-pipe into the liquid contained in the hydraulic main. An effective seal is thus made. When the retort is charged, the operator pulls a rod or chain passing over a pulley or attached to a lever, which raises the cap and attendant pipe; the seal or dip is thus broken, and the gas allowed to flow freely into the hydraulic. The cap, however, is not raised sufficiently high to break its seal or water-lute, so that no gas can escape from the hydraulic except through its appropriate channel. The cap is provided with a hole and cover, which on being removed access to the ascension can be readily obtained, and the greatest facility afforded for the removal of any obstruction.

3006.—TOZER, C. W., Treherne Road, North Brixton, "*Improvements in water-waste preventers for water-closets, urinals, washing and other apparatus.*" Provisional protection only obtained. Dated Sept. 13, 1873.

The advantages derived from this invention consist in the action of the valve, which, being fixed in the bottom of a cistern, which, having a division across and below it, when opened, allows part of the water to run into a back chamber, which, when the valve is shut, passes under or through a partition into the front chamber, discharges sufficient water to trap any valve, pan, or other closets, urinals, washing and other apparatus. By this means the closet basins are never left dry; at the same time the valve, being large, lets the water out of the cistern into the front chamber, down the service-pipe quickly; thoroughly cleansing the trap of either valve, pan, hopper, or other closets, &c.

3017.—WALKER, W., Manchester, "*Improvements in apparatus for regulating and controlling the temperature of liquids and fluids.*" Provisional protection only obtained. Dated Sept. 15, 1873.

In performing this invention there is placed in the boiler, flue, or other receptacle containing heated liquid or fluid an air-tight vessel or chamber filled with some expansive liquid or fluid (for instance with atmospheric air). This vessel or chamber is connected by a pipe or otherwise, with a tube or cylinder having one of its ends open, in which is fitted, in an air-tight manner, a moveable piston, connected by a crank or other suitable mechanical arrangements for transmitting motion, with the regulator, damper, valve, or cock which it is intended to actuate.

3077.—MARTIN, J. W., Liverpool, "*An improved tube expander and stopper.*" Patent dated Sept. 19, 1873.

This invention consists in forming or constructing the end plates of a tube expander or stopper, each with conical or angular surfaces, and in fitting a ring or rings with corresponding conical or angular surfaces to work thereon. Instead of a ring or rings, flexible or elastic packing may be used. A bolt and nut, or their equivalents, are employed to draw the end plates together and expand or stop the tube by expanding the packing. Two of such apparatus, with a bolt common to both, and a sleeve keeping them separate, serve, by simply tightening the nut or its equivalent, to close both ends of a tube at the same time.

3082.—SANDERSON, S., and PROCTOR, A., Huddersfield, "*Improved means or apparatus for economizing the waste heat and gases from boilers and other fur-*

naces, part thereof being useful as a water or liquid meter." Provisional protection only obtained. Dated Sept. 19, 1873.

This invention principally relates to apparatus to be placed in the flue leading from the boiler, such apparatus consisting of a series of pipes depending from boxes or chambers with smaller pipes placed inside said pipes, such smaller pipes depending from an upper chamber in said boxes or chambers. Lids or covers are provided to the outer pipes, and also to said boxes or chambers for purpose of cleaning interior, and scrapers are applied to cleanse exterior surface. Motion may be given to scrapers either by fan or fly in main flue, or automatically by power of water passing through said pipes; such automatic motion being used as a water or liquid meter.

APPLICATIONS FOR LETTERS PATENT.

1824.—Bell, J., Wishaw, N. B., "Improvements in distilling coal, shale, and other substances for the production of oil and gas, and in the apparatus employed therein." May 23, 1874.

1826.—Goodall, R., Armley, Leeds, "Improved means or method of clarifying sewage and impure waters, and rendering the precipitate or 'sludge' combustible and useful as fuel." May 23, 1874.

1851.—Clark, A. M., Chancery Lane, London, "Improvements in apparatus for carburetting air and regulating the supply to the burners." A communication. May 27, 1874.

1868.—Oram, W., Salford, "Improvements applicable to machinery for pumping or forcing water, air, or other fluids under pressure." May 28, 1874.

GRANTS OF PROVISIONAL PROTECTION.

1510.—Bond, Dr. F. T., Gloucester, "The preparation of improved materials for disinfecting and deodorizing purposes." April 30, 1874.

1709.—Budenberg, A., Manchester, "Improvements in meters for measuring the flow of liquids." A communication. May 14, 1874.

1711.—Beale, J., East Greenwich, Kent, "An improved engine to be used for pumping gases, air, or fluids." May 14, 1874.

1732.—Underhay, F. G., Clerkenwell, Middlesex, "Improvements in apparatus for drawing off water to prevent or reduce waste." May 15, 1874.

1764.—Kidd, J. H., Wrexham, "Improvements in the preparation and application of certain materials for deodorizing sewage and like matters, and in the manufacture of artificial manures." May 19, 1874.

1799.—Alexander, E. P., Southampton Buildings, London, "Improvements in liquid-meters." A communication. May 21, 1874.

NOTICES TO PROCEED.

219.—Griffin, J. T., Upper Thames Street, London, "Improvements in the construction of wrenches for turning pipes, bars, and other similar articles." A communication. Jan. 16, 1874.

242.—Gedge, W. E., Wellington Street, Strand, London, "Improvements in gas-burners with lateral and covered jets." A communication. Jan. 19, 1874.

839.—Willoughby, J., Plymouth, Southwell, W. A., and Briggs, T. J., Palmerston Buildings, London, and Willoughby, S., Plymouth, "Improvements in apparatus for distilling tar and the products thereof." March 7, 1874.

873.—Newton, A. V., Chancery Lane, London, "An improvement in pumps." A communication. March 10, 1874.

991.—Howard, J., Camberwell, Surrey, "A new self-acting apparatus for regulating the supply of water, and disinfectant for flushing and disinfecting water-closets." March 21, 1874.

1619.—Frost, H., Manchester, "Improvements in fluid-meters, applicable also to apparatus for obtaining motive power and for pumps." May 7, 1874.

1652.—Butterworth, E., Manchester, "Improvements in gas-engines." May 9, 1874.

1698.—Warner, W. J., South Shields, and Cowan, W., Edinburgh, "Improvements in gas-meters." May 13, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3953.—Paget, F. A., Adelphi, London, "Improvements in the mode of and apparatus for softening and purifying water." A communication. Dec. 2, 1873.

246.—Vaughan, E. P. H., Chancery Lane, London, "Improvements in apparatus for generating inflammable gas by the carburization of atmospheric air." A communication. Jan. 19, 1874.

467.—Caffall, R. M., Fleet Street, London, and Thomas, A., Alton, Hants, "Improved means of and appliances for effecting the automatic sealing of hydraulic gas-mains, and for removing the pressure of gas on retorts at pleasure." Feb. 5, 1874.

601.—M'Beath, C., South Cobbinshaw, N.B., "Improvements in retorts and apparatus connected therewith." Feb. 18, 1874.

766.—Beck, W. H., Cannon Street, London, "Improvements in the manufacture of illuminating gas and in apparatus employed therein." March 2, 1874.

773.—Souchard, S. H., Paris, "Improvements in lamps, and in apparatus connected therewith." March 3, 1874.

788.—Fielding, J., Gloucester, "Improvements in engines for pumping purposes." March 4, 1874.

800.—Forbes, Rev. G. H., Broughton, Northampton, "A new or improved compound for use as fuel, or for the manufacture of gas for heating and illuminating purposes, capable also of being used in the production of a material suitable for the purification of gas." March 4, 1874.

815.—Haseltine, G., Southampton Buildings, London, "Improvements in dry gas-meters." A communication. March 5, 1874.

897.—Bayley, H. D., and Bayley, G. H., Leek, Staffs, "Improvements in the construction of taps or valves, which improvements are also applicable to the fixing of glass tubes in water-gauges." March 12, 1874.

907.—Hunter, A. G., Flint, North Wales, "New and improved apparatus for carburetting atmospheric air, and improvements in other apparatus connected therewith." March 13, 1874.

942.—Alliott, J. B., Radford, Notts, "Improvements in the construction and arrangement of engines worked by steam or other fluid pressure, which engines are also applicable as pumps for raising and forcing, or as meters for measuring fluids." March 17, 1874.

1011.—Hendrix, P. J., Zolder, near Hasselt, Belgium, "Improved means or appliances for protecting or preserving from explosion lamps, cans, and holders containing petroleum or other explosive liquid or gas." March 23, 1874.

1200.—Forbes, Rev. G. H., Broughton, Northampton, "A new or improved method of utilizing the foul lime of gas-works." April 6, 1874.

1287.—Hulett, D., High Holborn, London, and Chandler, S., London Road, Southwark, "Improvements in apparatus used in the manufacture of gas." April 14, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1339.—Newton, W. E., "Improved apparatus for generating and carburetting illuminating gas." May 18, 1871.

1348.—Hunt, E., "Improvements in gullies or stench-traps." May 19, 1871.

1376.—Reinlein, G., "An improved pump." May 23, 1871.

1382.—Darwin, S. B., "Improvements in apparatus used in the manufacture of gas." May 23, 1871.

Share List,
OF
Metropolitan Gas and Water Companies.

(*Corrected by Mr.* F. N. Golding, *Sun Court, Cornhill, from the latest Stock Exchange Quotations.*)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	14 — 16
5000	20	Bahia (Limited)	20 0 0	3 0 0	11 — 13
1000	20	Do., preference	20 0 0	10 0 0	25 — 27
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	6 15 0	6 — 6¼
10000	5	Do., fourth issue	4 0 0	6 15 0	¾—1¼ pm.
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	34 — 36
7500	20	Cagliari (Limited)	20 0 0	7 0 0	15 — 17
180000	10	*Chartered* A ordinary	10 0 0	10 0 0	16 — 16⅝
25000	10	Do. A, 5 per cent. preference	18 0 0	5 0 0	14¼— 15
20000	10	Do. A, 5 per cent. do., 2nd issue	10 0 0	5 0 0	14⅜— 15
30000	10	Do. A, 5 per cent. do., 3rd issue	10 0 0	5 0 0	
10000	10	Do. B, 4 per cent. maximum	10 0 0	4 4 0	6¾— 7¼
20000	10	Do. C, 10 per cent. preference	10 0 0	10 0 0	20 — 21
12000	25	Do. D, 10 per cent. preference	25 0 0	10 0 0	50 — 52
448875*l.*	Sk.	*Commercial*	100 0 0	10 0 0	167 —170
20000	20	Continental Union	20 0 0	8 0 0	19 — 20
20000	20	Do., new	12 10 0	8 0 0	½ dis.—par.
10000	20	Do., preference (Grmny.: Strsbg. France: Cette, Nismes, Montargis Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	23 — 25
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 17
5000	10	Do., preference	10 0 0	6 0 0	11¼— 12½
10000	10	Do., ordinary	10 0 0	7 0 0	12 — 13
2500	10	Do., converted	2 0 0	10 0 0	3½— 4½
2500	10	Do., converted	2 0 0	7 0 0	2½— 3
23406	10	European (Limited)	10 0 0	8 0 0	14 — 15
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	7 10 0	8 0 0	2½— 3
4054	10	Foreign and Colonial (Limited)	10 0 0	..	9 — 10
5000	10	Hong Kong (Limited)	10 0 0	10 0 0	13¼— 14½
1560000	100	*Imperial*	100 0 0	10 0 0	160 —172
78000	12½	Do., new shares	12 10 0	7 0 0	16 — 16½
1300	100	Do., bonds	£100	10 0 0	195 —198
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Frankfort-on-Maine, Haarlem, Stolberg, and Vienna.)	43 15 0	9 2 6	56 — 58 xd.
3000	40	*Independent*	40 0 0	10 0 0	65 — 67
3000	10	Do.	10 0 0	5 0 0	8¼— 9¼
3000	20	Do.	20 0 0	7 10 0	25 — 26
4500	10	Do., D	3 0 0	10 0 0	3 — 4 pm.
378350*l.*	Sk.	*London*	100 0 0	10 0 0	167 —169
150000*l.*	Sk.	Do., 1st preference	100 0 0	6 0 0	118 —122
14450	Sk.	Do., 2nd preference	100 0 0	6 0 0	
4350	Sk.	Do., 3rd preference	100 0 0	6 0 0	
7622	25	Do., A shares	12 10 0	6 0 0	
268051.	All	Do., Debenture stock	100 0 0	5*l.* & 6*l.*	
15000	5	Malta and Mediterranean (Limited)	5 0 0	5 0 0	2¼— 2⅜
6000	5	Do., preference	5 0 0	7 0 0	5 — 5⅛
20000	5	Mauritius (Limited)	2 0 0	7 0 0	2 — 2⅛
25000	20	Monte Video (Limited)	20 0 0	..	23 — 24
8000	10	Nictheroy, Brazil (Limited)	10 0 0	..	
30000	5	Oriental (Calcutta)	5 0 0	9 0 0	6¾— 7¼
30000	5	Do., new shares	2 10 0	9 0 0	¾— 1¼ pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	1¼— 2⅛
17500	10	Pará (Limited)	10 0 0	7 0 0	6 — 8
27000	20	*Phœnix*	20 0 0	10 0 0	33½— 34½
360000*l.*	100	Do., new	55 0 0	7 10 0	71 — 73
144000*l.*	Sk.	Do.	100 0 0	5 0 0	93 — 95
5000	20	*Ratcliff*	20 0 0	10 0 0	32 — 34
36000	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	31½— 32½
7359	5	Singapore (Limited)	5 0 0	7 10 0	4¼— 5
2000	5	Do., preference	5 0 0	7 10 0	5½— 6
1500	32½	Shanghai	32 10 0	12 0 0	30 — 32
4000	50	*South Metropolitan*	50 0 0	10 0 0	85 — 87
4000	12½	Do.	12 10 0	10 0 0	21 — 21½
20000	12½	Do., new shares	5 0 0	10 0 0	6¼— 6¾ pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16¼— 16⅞
10000	10	Do., new	7 0 0	10 0 0	5 — 5½ pm.
9000	4	United General (Limerick)	4 0 0	2 10 0	2 — 2¼
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	14 — 15
1500	10	Do.	10 0 0	7 10 0	11 — 12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0½	7¾ — 8
10000	5	Do., new shares	2 10 0	10 0 0½	— 4
		WATER COMPANIES.			
12000	100	Chelsea	100 0 0	6 0 0	124 —126
1800000	100	East London	100 0 0	6 0 0	124 —126
8000	50	Grand Junction	50 0 0	8 10 0	75 — 77
5840	25	Do., ¼ shares	25 0 0	8 10 0	36½— 37½
2160	25	Do., new do.; maximum dividend, 7½ per cent.	25 0 0	7 10 0	31 — 33
4396	100	Kent	100 0 0	6 0 0	125 —127
5339	100	Lambeth	100 0 0	6 5 0	125 —127
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	
4443	100	Do.	30 0 0	8 0 0	36 — 38
400000	100	Do., debenture stock, 4 per cent.	100 0 0	4 0 0	97— 99
3036	100	Southwark and Vauxhall	100 0 0	5 10 0	104— 106
1296	100	Do., preference stock	100 0 0	5 0 0	101— 103
	100	Do., D shares	100 0 0	5 10 0	99— 101
		Do.	..	4 10 0	
	100	Do., new ordinary	..	4 10 0	
1600	100	Do., new ordinary, No. I	40 0 0	4 10 0	
12172	61	West Middlesex	61 0 0	£6 per sh.	123—125

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

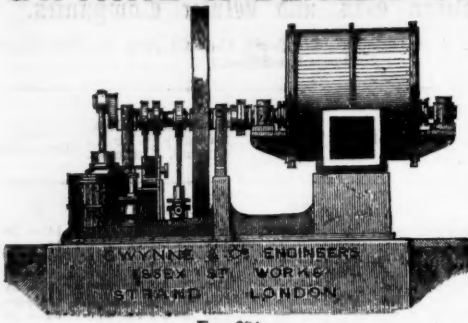


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

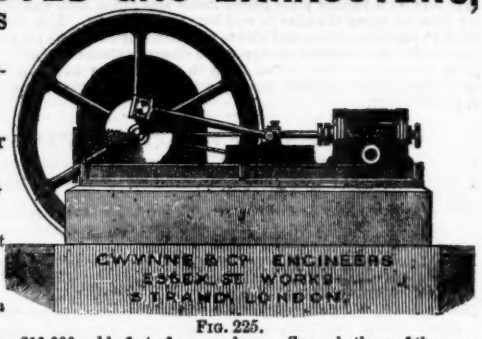


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES, CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

Now ready, price 7s., by Post 7s. 3d.,
A SECOND EDITION (fcap. 8vo., morocco gilt)
OF
THE GAS MANAGER'S HANDBOOK;
CONSISTING OF
Tables, Rules, and Useful Information for Gas Engineers, Managers,
And others engaged in the Manufacture and Distribution of COAL GAS.
BY THOMAS NEWBIGGING, A.I.C.E.

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Just published, a pamphlet, price 2s.

METROPOLIS GAS SUPPLY: On the Chartered Gas Revision, 1874, by ARTHUR SILVERTHORNE, C.E., a detail criticism of the late Award issued by the Board of Trade Commissioners respecting the Price of Gas supplied by the Chartered Gas Company in 1874.
LONDON: LIVERMORE AND ROBINSON, 41, BEDFORD STREET, STRAND.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields. W. J. WARNER.

TO GAS COMPANIES, ENGINEERS, MANAGERS, &c.

DESIGNS & PLANS of GAS-WORKS,
EXTENSIONS AND ALTERATIONS,
DRAWINGS AND TRACINGS OF GASHOLDERS,
TANKS, RETORTS, RETORT-HOUSE FITTINGS, ROOFS, GIRDERS, CONDENSERS, SCRUBBERS, ENGINES, BOILERS, EXHAUSTERS, PURIFIERS, GOVERNORS, VALVES, &c.,
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J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

RETORT SETTING & WORKING.
AN ILLUSTRATED PAMPHLET,
BY E. S. CATHELS.
To be had of Mr. W. B. KING, 11, Bolt Court, Fleet Street, London. Price 2s. 6d., post free.

WORKING DRAWINGS AND SPECIFICATIONS
OF
CATHELS'S IMPROVED RETORT SETTINGS
To be Heated by Coke, Tar, or Breeze.
For terms, apply to E. S. CATHELS, Gas-Works, Montreal, Canada.

GAS CONSUMERS MANUAL (Illustrated);
Or, HOW TO OBTAIN GOOD LIGHT & CHEAP GAS.
BY E. S. CATHELS. Price 1s. 2d., post free.
LONDON: W. B. KING, 11, BOLT COURT, FLEET STREET, E.C.

BRITISH
ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING OF MEMBERS.

CIRCULAR OF ARRANGEMENTS.

THE

ELEVENTH ANNUAL GENERAL MEETING

OF THE MEMBERS OF THIS ASSOCIATION WILL BE HELD ON

TUESDAY, WEDNESDAY, & THURSDAY, the 9th, 10th, & 11th of June, 1874,

AT

THE SOCIETY OF ARTS ROOMS,
JOHN STREET, ADELPHI, LONDON.

GEORGE T. LIVESEY, ESQ., MEMB. INST. C.E., PRESIDENT,
Will occupy the Chair.

ORDER OF PROCEEDINGS.

TUESDAY, JUNE 9, 1874.—Morning Meeting.

The Chair to be taken at Eleven o'clock.

Inaugural Address by the President. | Admission of New Members.
Reading of Papers and Communications.

Evening Meeting.

A Lecture will be delivered at the Society of Arts Rooms, by ROBERT ETHERIDGE, Esq., F.G.S., &c., &c., "On the Geology of Coal." The chair will be taken at Half-past Seven o'clock.

WEDNESDAY, JUNE 10, 1874.

The Chair to be taken at Eleven a.m.

Reading of Papers and Communications, and the Transaction of other Business.
Election of Officers for ensuing Year, &c.

At Six p.m. the Members and Friends will dine together at the Terminus Hotel, Cannon Street.
Tickets for the Dinner, 7s. 6d. each, may be had from the Secretary.

THURSDAY, JUNE 11, 1874.

An Excursion by Steamboat to Woolwich to inspect the Royal Arsenal, for which special arrangements have been made with the sanction of the War Department.

LIST OF PAPERS AND COMMUNICATIONS
TO BE SUBMITTED TO THE MEETING.

"Vincent's Patent Gratings applied to Gas-Retorts." By Mr. HODGSON JONES, of London.
"Purification." By Mr. GEORGE ANDERSON, of London.
"Condensation and its Effects in the Retention of Naphthaline." By Mr. JAMES WATSON, of the Crystal Palace District Gas-Works, London.
"Desirability of Companies extending their Control to the Point of Consumption." By Mr. ISAAC A. CROOKENDEN, London.
"Meters." By Mr. W. J. WARNER, of South Shields.
"Improved Method and Apparatus for Manufacturing Gas." By Mr. JOHN WEST, of Maidstone.
"Retention of Naphthaline." By Mr. G. D. MALAM, of Halifax.
"Gasholders." By Mr. C. WOODALL, of London.
"Unique Effects from Simple Means; or, a Description of the latest results obtained by Mr. Abraham Malam from his New Process for Manufacturing Cannel Gas, with Models, &c." By Mr. G. D. MALAM, of Halifax.
"Gasholder Tanks in Concrete," by Mr. J. DOUGLAS, of Portsea.

May 23, 1874. WILLIAM H. BENNETT, *Secretary.*

WANTED, Gasholder Makers.
Apply to W. C. HOLMES AND CO., Gas Apparatus Manufacturers, Whitestone Iron-Works, HUDDERSFIELD.

WANTED, by an active and persevering young man, a situation as CLERK. Has had five years experience in a country Gas-Work. No objection to go abroad.
Apply to W. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a second-hand cast-iron TANK or PURIFIER, to hold about 500 gallons. Size preferred 8 ft. by 4 ft. by 3 ft.
Apply, with dimensions and price, to THOS. H. METHVEN, BURY ST. EDMUND'S.

WANTED to purchase, 5000 to 10,000 tons of GAS COKE. Waggons can be sent to any station for any proportion of above.
Address G. J. EVESON, Gas Coal and Coke Merchant, STOURBRIDGE.

WANTED immediately, several good Retort-Setters. Also good Platers and Gasholder Riveters and Makers. None but thoroughly competent workmen need apply. Constant employment.
State terms, names of past employers, &c., by letter only, to W. W., 3, Wyndham Street, Bryanston Square, LONDON.

WANTED, an engagement as Manager or MANAGER and SECRETARY of a medium sized Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most excellent testimonials as to character and ability.
Address MANAGER, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a situation as Gas-Fitter, Meter-Fixer, Examiner, and Index-Taker. Has seven years character from a London Gas Company. The provinces preferred, and would not object to go abroad. Experienced in the general routine of a Gas-Work, both indoors and out.
Address K., 5, Easton Terrace, Paradise Road, CLAPHAM.

WANTED, by the Advertiser, aged 29, an engagement as ASSISTANT ENGINEER or Manager of a Gas-Work; 13 years experience in erecting and managing works, &c. Is a fair draughtsman. Has a knowledge of chemistry. Can analyze gas, &c., and use the photometer. Can furnish testimonials as to ability.
Address E. A., 18, Cawley Road, SOUTH HACKNEY, E.

WANTED, at Midsummer, by the Godalming Gas and Coke Company, a persevering, active, sober WORKING FOREMAN. He must thoroughly understand the management of clay retorts, be able to lay mains and services, and do gas-fittings efficiently. A smith would be preferred. House, coals, and gas found. State salary.
Applications, with testimonials, to be addressed to the SECRETARY, High Street, GODALMING.

WANTED, a Working Manager, to undertake the sole management, keep accounts, and collect quarterly bills, of a small Gas-Work (under one million consumption a year) in North Wales. He must be a strictly sober and honest man, and have a thorough practical knowledge of the setting and working of iron and clay retorts, and manufacture and distribution of gas, laying main and service pipes, &c.
Applications, with testimonials, stating age and wages expected, to be addressed to E., Post-Office, Amlwch, ANGLESEY.

WANTED, a practical Gas Manager.
He must be capable of taking charge of the manufacture and distribution of a district supplying at rental about £20,000 per annum.
Applicants to state age, where now employed, the rental of the works, the price of gas and coals, the capital employed, and the dividends paid.
Applications to be made in writing on or before Friday, the 12th inst., addressed to the Chairman and Directors of the Tottenham and Edmonton Gas Company, Tottenham, Middlesex. By order,
JAMES RANDALL, Secretary.
Edmonton, June 1, 1874.

FOR SALE, for One, Two, or Three years, the surplus TAR and LIQUOR made at the Lichfield Gas-Works.
Particulars on application at the works.

VINCENT'S
PATENT IMPROVEMENTS
IN
Apparatus for Manufacturing Gas.
Particulars to be obtained by application to—
MR. LAYARD JONES,
ENGINEER,
25, OLD BROAD STREET, LONDON, E.C.

ADVANTAGES OF GAS
FOR COOKING AND HEATING,
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MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.
Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

ROBUS, SIMPSON, & ROBUS,
(Late of the Crystal Palace District Gas-Works, Sydenham, and the New City Gas-Works, Montreal, Canada,)
GENERAL CONTRACTORS & RETORT-SETTERS,
FITTERS & MAIN-LAYERS.
RETORTS SET ON THE LATEST IMPROVED PLAN.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, KENT.

THE Advertiser desires an engagement as Manager, Assistant Engineer, or Superintendent of a Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most satisfactory testimonials as to character and ability.
Address Y. Z., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, an Evans's 100-inch Photo- METER, with clock-meter, governor, pressure-gauge, candle balance, &c., complete; also a Referees Sulphur Testing Apparatus. The whole in excellent condition.
Apply to the SECRETARY, Patent Gas Company, Limited, 25, Fenchurch Street, E.C.

SLIDE-VALVES.
FOR SALE—14 12-in. and 5 10-in. Slide- VALVES with outside racks. They have been thoroughly re-fitted, and are equal to new. A low price will be accepted to effect a clearance.
Apply to JAMES WATSON, Engineer and Manager, Crystal Palace District Gas Company, LOWER SYDENHAM, S.E.

FOR SALE, and ready for immediate delivery by the Barnstaple Gas Company, about 35 ft. of 12-in. Hydraulic Main, in five lengths; 15 ft. of 16-in. Hydraulic Main; cast-iron Stools for ditto; 21 15-in. Mouthpieces; a number of Ascension-Pipes, Bridges, and Dips; together with a quantity of odd castings suitable for a small work.
Feb. 26, 1874.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.
FOR SALE, a set of four Dry Lime Puri- FIERS, 10½ ft. diameter, 3½ ft. deep, 4 tiers of iron sieves, dry centre-valve, 9-in. connexions and lifting apparatus for covers.
The above are offered for sale on account of their being replaced by larger ones.
For price and particulars apply to F. W. OLDFIELD Manager.

HYDRAULIC MAIN AND RETORT FITTINGS FOR SALE.
THE Longton Gas Company have for SALE the Hydraulic Main, Ascension-Pipes, Front Plates, and all the necessary fittings of a Bench of Brick Retorts. The above will be sold at a cheap price.
For further particulars apply to Mr. J. M. DARWIN, Gas-Works, Longton, STAFFORDSHIRE.

THE Directors of the Birmingham and Staffordshire Gaslight Company are prepared to receive TENDERS for a supply of GAS COAL for the ensuing year, to be delivered at their works, at Birmingham, Saltley, and West Bromwich, in such quantities, monthly, as may be agreed upon.
Tenders to be sent to the Office of the Company on or before the 8th day of June next. By order,
SAMUEL WALSH, Secretary.
Old Square, Birmingham, May 27, 1874.

TO COLLIERY PROPRIETORS AND OTHERS.
THE Oldham Corporation Gas and Water Works Committee are prepared to receive TENDERS for a supply of CANNEL and COAL.
Particulars may be obtained on application to Mr. Herbert ANDREW, Gas and Water Offices, Oldham.
Tenders to be sent in to the undersigned on or before Tuesday, June 9, 1874. By order,
H. BOOTH, Town-Clerk.
Oldham, May 21, 1874.

THE Directors of the Wareham Gas and Coke Company are prepared to receive TENDERS for the supply of 250 tons of Pelaw Main, North Pelton, New Pelton Main, or Brancepeth GAS COALS (best quality), to be delivered, free of charge, into lighters at Russell Quay by the 20th of August next.
Payment will be made for the same two months from the time of delivery.
Tenders to be sent to my Office on or before the 26th of June next. F. FILLITER, Secretary.
Wareham, Dorset, May 30, 1874.

GAS PLANT for SALE, as good as new.
2 Lengths of D Hydraulic, 18 in. by 18 in., 9 ft. 3 in. long.
2 lengths of 18 in. diameter Hydraulic, 8 ft. long.
2 lengths of 18 in. diameter Hydraulic, 9 ft. long.
42 sets of Flanched Bridge-Pipes, 4 in. diameter, with 3 ground stoppers in each.
A lot of 4-in. Ascension-Pipes.
28 15-in. Mouthpieces, with sockets on side.
35 15-in. Mouthpieces, with sockets on top, all having ears, lids, and cross-bars complete.
28 Sight-Hole Boxes.
14 Furnace-Doors and Frames.
All the above are nearly as good as new, and will be put upon the rails at Peterborough for £7 10s. per ton.
2 Iron Roofs. One 26 ft. span, the other 19 ft. span. Ten principals in each, with louvres, laths, &c., complete. £10 per ton.
2 10-inch Donkin valves, 90s. each.
4 Wrought-Iron Doors, 9 ft. high by 4 ft. wide. £10 per ton.
Apply to Mr. TRIMEN, Contractor, Gas-Works, PETERBOROUGH.

SURPLUS PLANT FOR SALE.
TWO New Purifier Covers, 5 ft. 2 in. square, 15 in. deep—by Porter and Co., Lincoln.
1 new Rack Valve, 8 in.
1 Rack Valve, 6 in. 1 Screw Valve, 6 in. Both three years in use.
1 Cast-Iron Cistern, 12 in. by 12 in. by 15 in., with 3-in. sockets.
1 Cast-Iron Cistern, 18 in. by 18 in. by 18 in., with 2-in. sockets.
2 Cast-Iron Cisterns, 12 in. by 12 in. by 15 in., with 2-in. sockets.
1 Connexion for Scrubber, with Flange, 17 in.
2 Tees, 6 in. by 5 in., flange and socket; 1 Tee, 6 in. by 6 in.; 1 Tee, 7 in. by 5 in.; 1 Tee, 7 in. by 2 in.
5 Bends, 6 in.; 1 Flange Bend, 6 in.; 3 Bends, 5 in.; 2 Bends, 4 in.; 1 Syphon complete, 5 in.; 2 Syphons complete 2 in.; 2 Double Sockets, 6 in.; 2 Double Sockets, 7 in.; 1 Double Socket, 9 in.
8 Wrought Tramway Rails, 12 ft. each.
Apply to Mr. T. H. BOUTTELL, Manager, Gas-Works, SLEAFORD.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)
The HALF-YEARLY ORDINARY MEETING of the Imperial Continental Gas Association was held at the City Terminus Hotel, Cannon Street, London, on TUESDAY, the 26th inst.,
PHILIP TWELLS, Esq., M.P., the Chairman, when the following Resolutions were passed:—
Resolved unanimously—"That the report upon the affairs of the Association now read be received, adopted, and entered on the minutes."
Resolved unanimously—"That a dividend of £1 15s. per share be declared upon the 56,000 shares of the Association, for the half year ended the 31st of December last; and that the said dividend be payable, free of income-tax, on and after the 15th of June next."
Resolved unanimously—"That Sir Francis Henry Goldsmid, Bart., M.P., be re-elected a Director of the Association."
"That John Carrington Palmer, Esq., be re-elected a Director of the Association."
"That Thomas Henry Goodwin Newton, Esq., be re-elected a Director of the Association."
"That Thomas Newton Stokes, Esq., be re-elected an Auditor of the Association."
"That the thanks of the meeting be given to Mr. Julian Goldsmid, M.P., for his exertions on behalf of the Association in respect of the Bordeaux contract."
"That the cordial thanks of the meeting be given to the President and Directors for their able management of the affairs of the Association, and to the Chairman for his conduct in the chair this day."
Upon the motion of the Chairman (Mr. Philip Twells), a vote of thanks was also given to Mr. G. W. Drory, the General Superintendent of the affairs of the Association on the Continent, and to the Agents, Engineers, and other officers acting under him.
By order of the Board of Direction,
ALBERT F. JACKSON, Secretary,
30, Clement's Lane, Lombard Street,
London, May 27, 1874.

TO LIME BURNERS, MERCHANTS, &c.
THE Directors of the Barnsley Gas Com- pany are desirous of receiving TENDERS for the supply of the whole of the LIME required at their new and old works, at Barnsley, for purifying purposes, for One or Three years, commencing from July 1, 1874.
Any further particulars may be had on application to the undersigned.
Tenders, addressed to the Chairman, to be sent to me not later than Thursday, the 4th of June, 1874.
JOHN HUTCHINSON, Manager.
Gas Office, May 23, 1874.

TO MANUFACTURING CHEMISTS, TAR DISTILLERS, &c.
THE Directors of the Barnsley Gas Com- pany are desirous of receiving TENDERS for the purchase of the surplus COAL TAR produced at their works at Barnsley and Old Mill, for a term of One or Three years, commencing from the 1st of July next.
Probable quantity, and any other particulars, on application to the undersigned.
Tenders, addressed to the Chairman, to be sent to me not later than Thursday, the 4th of June, 1874.
JOHN HUTCHINSON, Manager.
Gas Office, May 23, 1874.

DARLINGTON CORPORATION—GAS DEPARTMENT.
TO BUILDERS, CONTRACTORS, AND ENGINEERS.
THE Darlington Corporation invite TENDERS for the following EXTENSIONS of their works, each contract to be tendered for separately:—
CONTRACT No. 1.—For the Excavation, Puddling, Brickwork, &c., required to be done in the construction of a Gasholder Tank, 102 feet diameter, and 25 feet deep.
CONTRACT No. 2.—For the various works required to be done in the erection of a Retort-House, capable of containing 120 Retorts.
CONTRACT No. 3.—For the construction and erection of Wrought-Iron Roof for the previously named Retort-House.
Drawings, specifications, and conditions of Contract may be seen on and after the 18th inst., on application to Mr. WM. B. EMMERSON, Engineer and Manager, Gas-Works, Darlington, to whom all tenders must be sent, properly endorsed, not later than the 22nd of June next.
The Corporation do not bind themselves to accept the lowest or any tender. By order,
H. DUNN, Town-Clerk.

TENDERS FOR COAL.
THE Directors of the Bristol United Gaslight Company are desirous of receiving TENDERS for the supply of about 60,000 tons of GAS COALS during the nine months between the 1st day of July, 1874, and the 1st day of April, 1875, to be delivered at their Works, situated at St. Philip's and Canons Marsh, Bristol, or at the Railway Station, Bristol, or f.o.b. at a port of shipment. The quantity to be made up partly of small and partly of large Coal, and to be delivered in such monthly proportions as may be required in accordance with the season.
Parties tendering can do so for the whole or any lesser quantity, and for periods of either one, three, six, or nine months.
The tenders must state the name or description of the pit, and the particular seam from which the Coal is to be supplied, and how much the contractor would undertake to deliver in each month of either small or large Coal.
The contractor to furnish an analysis of the Coal offered, and to deliver the Coals of the accepted tender strictly in accordance with such analysis, and also fresh, of the best quality, and free from sulphur, bats, binds, refuse, and dirt.
The Company to be at liberty to determine the Contract without notice if the Coals are inferior to the quality contracted for.
Payments to be made monthly in accordance only with the weight (20 cwt. to the ton) as weighed upon the weigh-bridges of the Gas Company at their respective stations.
Security for the faithful execution of the Contract to be given if required by the Company.
Tenders to be sent in to the Office of the Gas Company, Canons Marsh, Bristol, on or before Tuesday, the 23rd day of June proximo, addressed under seal to the Secretary, and marked "Tender for Coal."
By order of the Directors,
HENRY H. TOWNSEND, Secretary.
Gaslight Office, Canons Marsh, Bristol, May 29, 1874.

THE PRACTICAL GAS-FITTER'S GUIDE (Second Edition), giving a detailed account of Gas Lighting, the cost of Gas-Works for Mansions, with a Sheet of Drawings. Post free for 30 stamps.
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To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 37 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
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By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.
Licences to work the invention will be granted to Gas Companies on very reasonable terms.
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The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

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These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.
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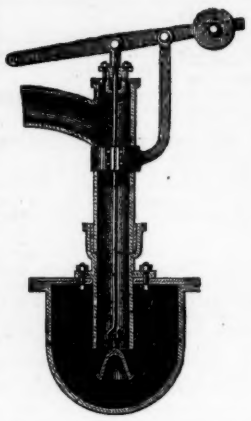

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Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering great security against the drawing of air, and obviating the necessity for using any liquid in the now so-called hydraulic main. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the bottom of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted lever.
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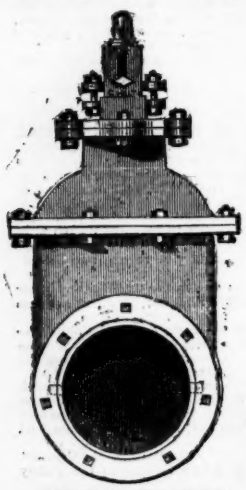

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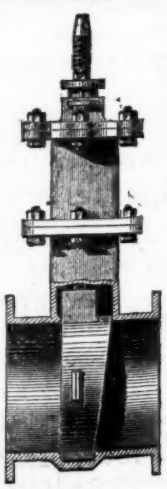
The front facing is vertical; the back facing forms the wedge.
At a slight additional expense both flanges are faced to bolt to main-pipes.



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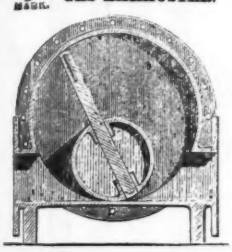

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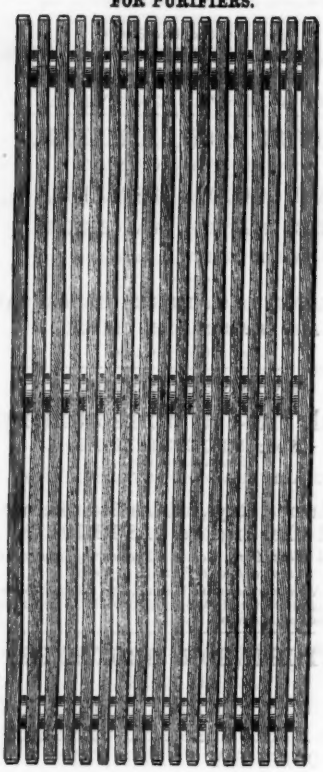

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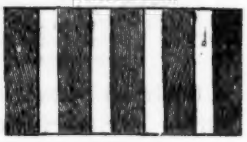

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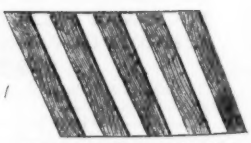

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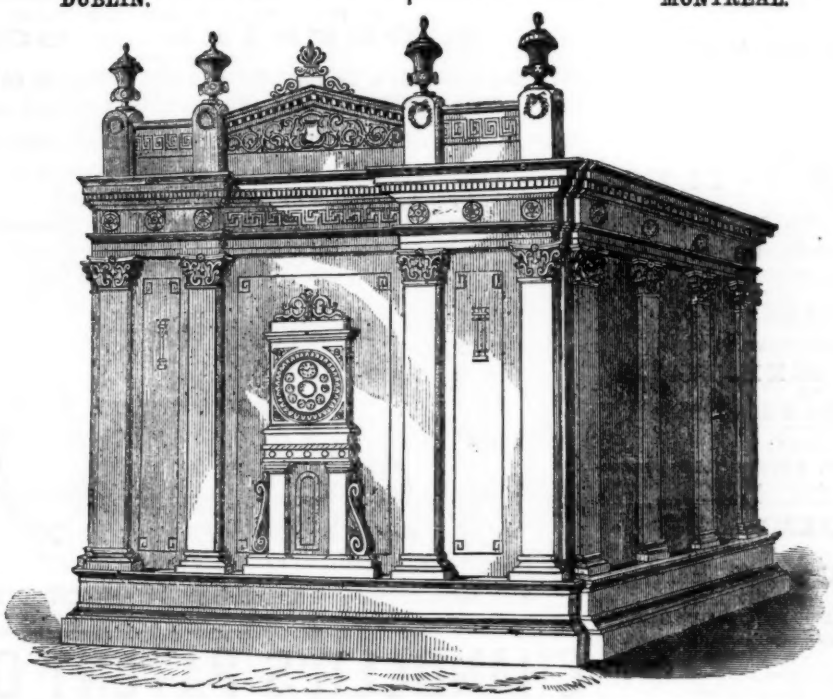

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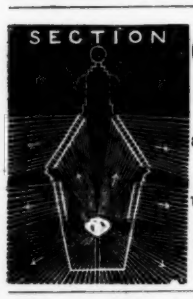
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.



THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

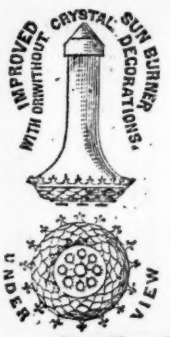
GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.

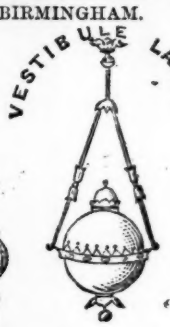
CAST-IRON GAS AND WATER PIPES.
MALLEABLE IRON TUBE FOR GAS, WATER, AND STEAM.
AGENTS FOR THOMAS GLOVER & CO.'S
PATENT DRY GAS-METERS.
DELIVERY F.O.B. ON CLYDE.
Lists on application.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

F. & C. OSLER,
45, OXFORD STREET, LONDON, W.
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

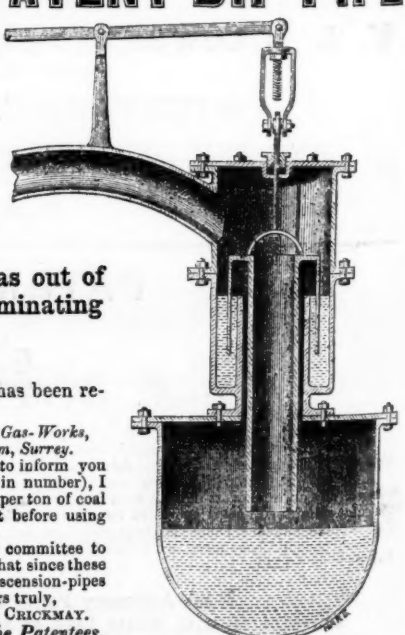
TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.





GAS MOONS,
Cut and Engraved, of the newest designs;
GAS REFLECTORS
In Silver and Glass;
GAS NIBS
AND
BURNERS
Of every description.
Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.
City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

CHANDLER'S PATENT DIP-PIPE



The advantages are—
1st, There is no pressure on the Retorts.
2nd, No deposit of Carbon.
3rd, No scurfing required.
4th, Never a choked Ascension Pipe.
5th, Saves Fuel and Wear and Tear.
6th, Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7th, Is never out of order.

The following (among other letters) has been received:—
Engineer's Office, Metropolitan District Asylum Gas-Works, Caterham, Surrey.
Messrs. Chandler and Sons.
Dear Sirs,—In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.
I should add that I intend recommending the committee to adopt them throughout these works. I also find that since these Dip-Pipes have been fitted, I have had no ascension-pipes choked, which was before a great nuisance.—Yours truly,
Jan. 15, 1874. WM. CRICKMAY.
For terms of use and cost, apply only to the Patentees,
Messrs. CHANDLER & SONS, ENGINEERS & CONTRACTORS, YORK STREET, LONDON ROAD, SOUTHWARK, LONDON, S.E.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

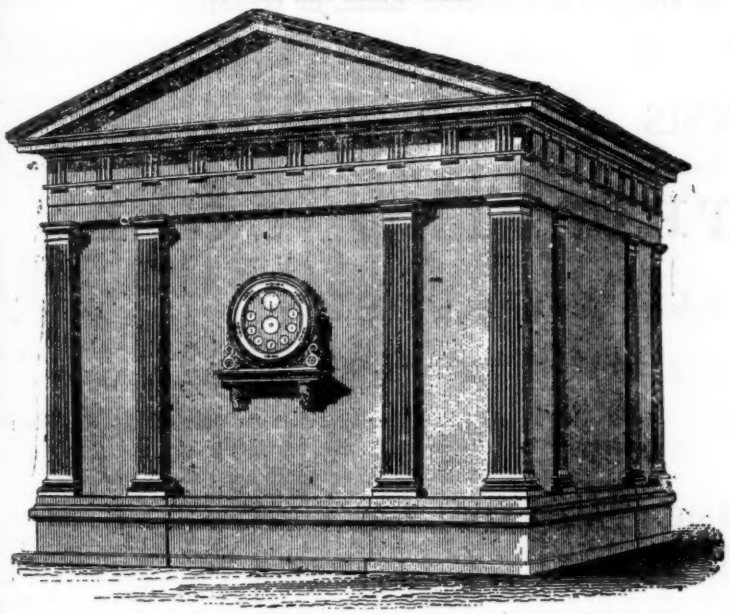
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

WATER-METERS SUITABLE FOR ALL PRESSURES.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

CANNEL COAL.

ELLIS LEVER & CO.,

GAS COAL MERCHANTS,

107, PICCADILLY, MANCHESTER.

ALL CLASSES OF

ENGLISH, SCOTCH, & WELSH CANNEL COALS.

CANNEL COAL.

COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

THE

HUCKNALL COLLIERY COMPANY

Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

THE MIDLAND COAL COMPANY

Are prepared to enter into CONTRACTS with

CORPORATIONS & GAS COMPANIES

FOR SUPPLIES OF

GAS COAL & CANNEL.

Prices, Analysis, and other information on application at the

MIDLAND COAL OFFICES,

118a, OXFORD STREET, MANCHESTER.

OMOA GAS COAL.

THE OMOA AND CLELAND IRON AND COAL COMPANY, LIMITED,

ARE NOW IN A POSITION TO

SUPPLY FROM THEIR PITS AT OMOA

GAS COAL

OF A VERY SUPERIOR QUALITY.

This Coal, according to the report of the analyst, yields 11,110 cubic feet of gas per ton, and has an illuminating power of 33·97 candles per 5 cubic feet per hour.

Copies of the analysis and full particulars as to price, &c., may be had on application to the SECRETARY of the COMPANY, 172, West George Street, GLASGOW.

EVERY DESCRIPTION

OF

GAS COAL AND CANNEL

SUPPLIED BY

E. FOSTER & CO.,

COAL and CANNEL

MERCHANTS,

21, JOHN STREET, ADELPHI,

LONDON, W.C.

Prices Quoted on application.

LEE and JERDEIN,

COAL OWNERS & MERCHANTS.

Chief Office:

9, LANCASTER PLACE, STRAND, LONDON, W.C.

SOLE VENDORS FOR

LONDON & THE SOUTHERN COUNTIES

OF

WIGAN COAL AND CANNEL,

From the Mines of the

INCE HALL COAL & CANNEL COMPANY, Limited,

AND

Messrs. W. H. BRANCKER & Co.

WILSONTOWN GAS COAL.

This Coal bears a close resemblance to the Lesmahago seam. It has a first-class Coke, equal to the Lesmahago, and greater in quantity, and 10,538 Cubic Feet of 33·2 Candle Gas.

For rail in Scotland, or shipped at Glasgow, Leith, or Granton.

ANALYSIS AND REPORT

ON

CLIMPY TRIPPING COAL,

FOR GAS PURPOSES.

The results of this analysis, as shown below, were got from actual working, and we have therefore the utmost confidence in placing it, along with that annexed, before you.

COMMERCIAL RESULTS.

Gas per ton of Coal—temperature 60°—barometer 30 inches	10,200 cubic feet.
Coke per ton of Coal	1,400 lbs.
Durability of one cubic foot of the gas, by jet of 5-inch flame	48 min. 24 sec.
Illuminating power in standard candles	14·9

REMARKS.

Being well acquainted with Durham and Northumberland Coals, I have no hesitation in saying that "CLIMPY TRIPPING" is superior to any (containing, besides, a greater proportion of pieces from 7 to 14 lbs. weight), with far less impurities for purification, more gas, and coke equal in calorific power. It has a large mixture of cannel nuts, which accounts for the good quality of the gas, at our photometer in town, 1000 yards from the works.

It is also a very superior Coal for mixing with oils, as by Mackenzie's patent; or with acid tar, or tar oil, shale grease, or other refuse from paraffin-works, as by system of Mr. Scott, of Musselburgh, or Mr. Foster, Portobello, the Coal being easily crushed.

Below are the results realized by myself, when mixed with acid tar from paraffin work, received by me in a solid state, having been run on to very fine dross. My charges were 2 cwt. tripping and 28 lbs. of acid tar, each retort, running six hours; with lighter charges I get more gas, but not so good quality, or so much coke.

Gas per ton of Coal	10,800 cubic feet.
Coke per ton of Coal	1,540 lbs.
Durability of one cubic foot of gas, by jet of 5-inch flame	58 min. 28 sec.
Illuminating power in standard candles	27·29

The first truck received being tried with very light charges (unmixed), and running five hours, I got 10,500 cubic feet of 14-candle gas; and I am confident, practical managers, with good retort-fittings (mine being very inferior), and exhausters at work, as I have seen generally at home and abroad, will take 11,000 feet of 13-candle gas from it. My retorts are 8 feet × 2 feet × 14 inches, D shape, heavy dip, and no exhauster.

These remarks of mine you may perhaps think rather lengthy, but they will be the more intelligible to any manager inquiring for Climpy Tripping.

L. MONK,
Engineer and Manager.

Lanark Gas-Works, April 20, 1874.

GRAY AND PAUL,

WILSONTOWN GAS COAL WORKS & CLIMPY COLLIERY,

BY CARNWATH, N.B.

G. J. EVESON,

GAS COAL MERCHANT,

STOURBRIDGE.

Delivery per Rail to any Part.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

RUSSEL'S BOGHEAD.

MUIRKIRK, No. 1, CANNEL
Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

MUIRKIRK, No. 2, CANNEL
Yields 10,709 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL
Yields 12,550 cubic feet of 33-candle gas per ton.
Prices and full Analyses on application.

ALBERT GAS COAL.

THE DERBYSHIRE
SILKSTONE COAL COMPANY,
LIMITED,
CAN OFFER A
GAS COAL
Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO
Mr. EDMUND TAYLOR, Secretary,
ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

DUKINFIELD CANNEL COAL.

THE DUNKIRK COAL COMPANY.

OFFICES:

ASTLEY DEEP PIT, DUKINFIELD.

ANALYSIS, PRICES, AND OTHER INFORMATION, ON APPLICATION AT THE ABOVE OFFICES.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS.
LONDON, 1862;
DUBLIN, 1865
PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS

of the highest excellence.

STATION-METERS AND GOVERNORS.

STREET-LAMP REGULATORS.

TESTING APPARATUS

of the most perfect description for all purposes relating to Gas.

NOW READY.

"GAS MEASUREMENT AND GAS-METER TESTING," by F. W. HARTLEY, A. Inst. C.E.
Third Edition, cloth boards, 2s.; per post, 2s. 2d.

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE: 106, CANNON STREET, E.C.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES
TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 2, 1874.